

November 20, 2006

Fluid Minerals Group  
Bureau of Land Management  
Vernal Field Office  
170 South 500 East  
Vernal, Utah 84078

RE: Application for Permit to Drill - Petro-Canada Resources (USA), Inc.  
**Rye Patch Fed 24-21** - 606' FNL & 2,144' FWL, NE/4 NW/4,  
Section 24, T11S, R14E, SLB&M, Duchesne County, Utah

Dear Fluid Minerals Group:

On behalf of Petro-Canada Resources (USA), Inc. (Petro-Canada), Buys & Associates, Inc. respectfully submits the enclosed original and three copies of the Application for Permit to Drill (APD) for the above referenced federal surface and mineral vertical well. Included with the APD is the following supplemental information:

Exhibit "A" - Survey plats, layouts and cross-section of the proposed well site;

Exhibit "B" - Photos of the proposed well site;

Exhibit "C" - Proposed location maps with access & pipeline corridor;

Exhibit "D" - Drilling Plan;

Exhibit "E" - Surface Use Plan;

Exhibit "F" - Typical BOP and Choke Manifold diagram.

Please accept this letter as Petro-Canada's, written request for confidential treatment of all information contained in and pertaining to this application.

Thank you very much for your timely consideration of this application. Please feel free to contact myself or Alan Vrooman of Petro-Canada at 303-350-1171 if you have any questions or need additional information.

Sincerely,

*Don Hamilton*

Don Hamilton  
Agent for Petro-Canada

cc: Alan Vrooman, Petro-Canada  
Carla Konopka, Petro-Canada  
Diana Whiney, Division of Oil, Gas & Mining

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DIV. OF OIL, GAS & MINING

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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

FORM APPROVED  
OMB No. 1004-0137  
Expires March 31, 2007

1a. Type of work: <input checked="" type="checkbox"/> DRILL <input type="checkbox"/> REENTER		5. Lease Serial No. UTU-084317
1b. Type of Well: <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other <input type="checkbox"/> Single Zone <input checked="" type="checkbox"/> Multiple Zone		6. If Indian, Allottee or Tribe Name N/A
2. Name of Operator Petro-Canada Resources (USA), Inc.		7. If Unit or CA Agreement, Name and No. N/A
3a. Address 1099-18th Street, Suite 400 Denver, Colorado 80202	3b. Phone No. (include area code) 303-350-1171	8. Lease Name and Well No. Rye Patch Fed 24-21
4. Location of Well (Report location clearly and in accordance with any State requirements.) At surface 560137X606' FNL & 2,144' FWL, NE/4 NW/4, 4410979Y-110.297063 At proposed prod. zone 606' FNL & 2,144' FWL, NE/4 NW/4, 39.848593		9. API Well No. 13-013-33443
14. Distance in miles and direction from nearest town or post office* 26.92 miles southwest of Myton, Utah		10. Field and Pool, or Exploratory <del>undesignated</del> Windcat
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 606'		11. Sec., T. R. M. or Blk. and Survey or Area Section 24, T11S, R14E, SLB&M
16. No. of acres in lease 1,159.93 acres		12. County or Parish Duchesne
17. Spacing Unit dedicated to this well 40 acres		13. State UT
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 2,900'		20. BLM/BIA Bond No. on file UT 1215
19. Proposed Depth 11,500'		21. Elevations (Show whether DF, KDB, RT, GL, etc.) 6,969' GR
22. Approximate date work will start* 05/01/2007		23. Estimated duration 35 days drilling 40 days completion

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature <i>Don Hamilton</i>	Name (Printed/Typed) Don Hamilton	Date 11/20/2006
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Title  
Agent for Petro-Canada Resources (USA), Inc.

Approved by (Signature) <i>Bradley G. Hill</i>	Name (Printed/Typed) BRADLEY G. HILL	Date 11-29-06
Title Office	ENVIRONMENTAL MANAGER	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.  
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

\*(Instructions on page 2)

Federal Approval of this  
Action is Necessary

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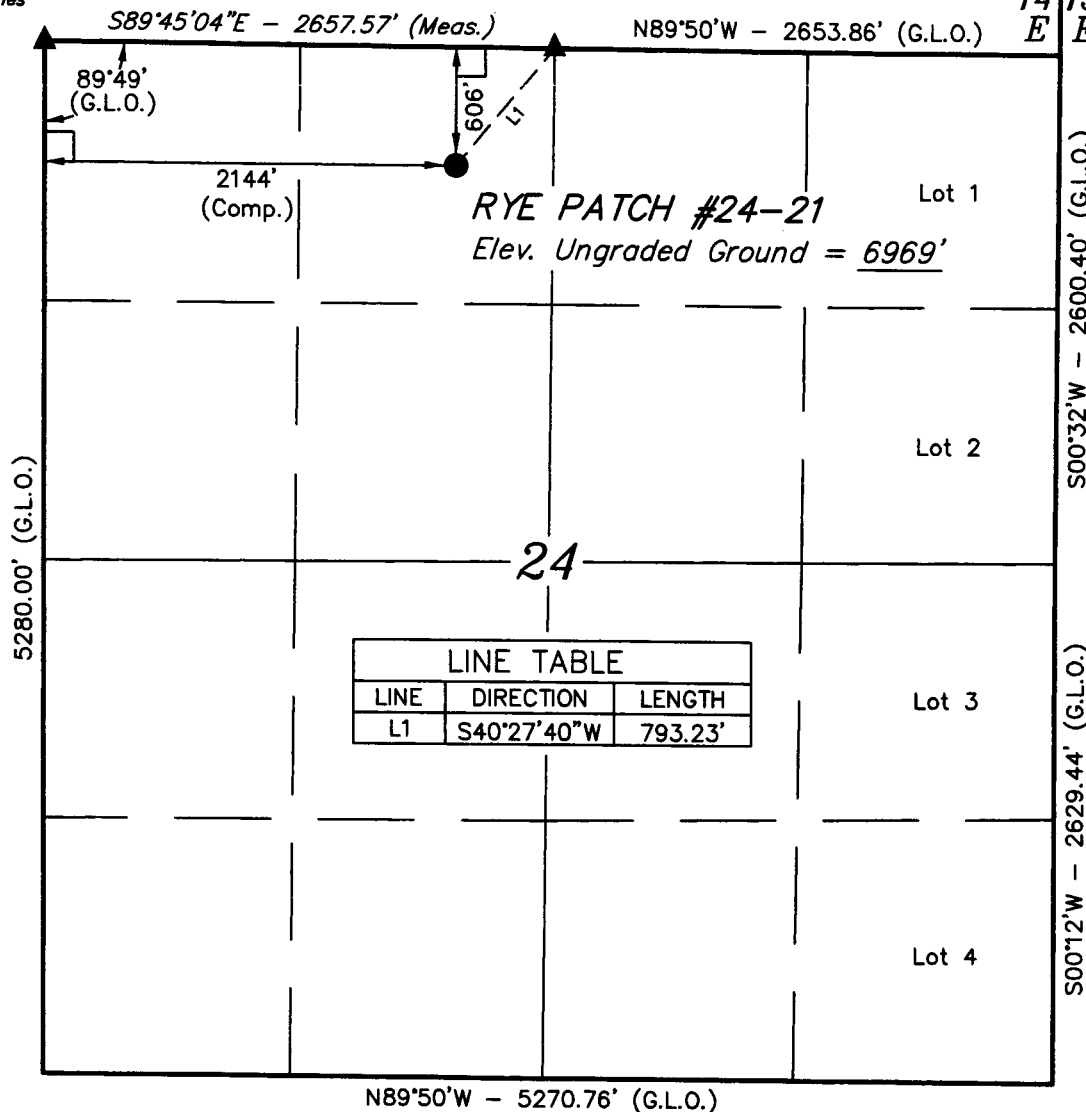
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**T11S, R14E, S.L.B.&M.**

1911 Brass Cap  
2.5' High, Pile of  
Stones



**LEGEND:**

- └─ = 90° SYMBOL
- = PROPOSED WELL HEAD.
- ▲ = SECTION CORNERS LOCATED.

(AUTONOMOUS NAD 83)  
LATITUDE = 39°50'54.74" (39.848539)  
LONGITUDE = 110°17'51.86" (110.297739)  
(AUTONOMOUS NAD 27)  
LATITUDE = 39°50'54.87" (39.848575)  
LONGITUDE = 110°17'49.30" (110.297028)

**PETRO-CANADA RESOURCES (USA), INC.**

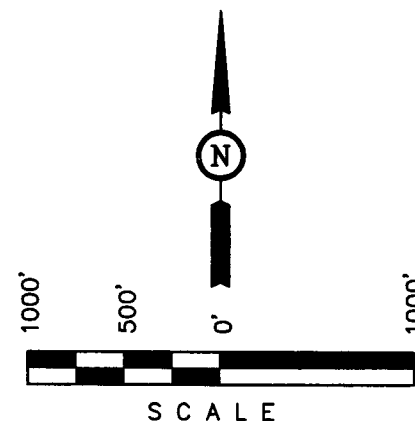
Well location, RYE PATCH #24-21, located as shown in the NE 1/4 NW 1/4 of Section 24, T11S, R14E, S.L.B.&M., Duchesne County, Utah.

**BASIS OF ELEVATION**

SPOT ELEVATION LOCATED AT A ROAD INTERSECTION IN THE SE 1/4 OF SECTION 4, T11S, R15E, S.L.B.&M. TAKEN FROM THE GILSONITE DRAW QUADRANGLE, UTAH, DUCHESNE COUNTY, 7.5 MINUTE QUAD. (TOPOGRAPHIC MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 7309 FEET.

**BASIS OF BEARINGS**

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



**CERTIFICATE**

THIS IS TO CERTIFY THAT THE ABOVE PLANS PREPARED FROM FIELD NOTES OF ACTUAL SURVEY MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR  
REGISTRATION NO. 161312  
STATE OF UTAH

**UTAH ENGINEERING & LAND SURVEYING**

85 SOUTH 200 EAST - VERNAL, UTAH 84078

(435) 789-1017

SCALE 1" = 1000'	DATE SURVEYED: 09-11-06	DATE DRAWN: 09-12-06
PARTY G.O. D.H. C.H.	REFERENCES G.L.O. PLAT	
WEATHER WARM	FILE PETRO-CANADA RESOURCES (USA), INC.	

## DRILLING PLAN

### Attachment for Permit to Drill

**Name of Operator:** Petro-Canada Resources (USA), Inc.  
**Address:** 1099 – 18<sup>th</sup> Street, Suite 400  
Denver, CO 80202  
**Well Location:** Rye Patch Fed 24-21  
606' FNL & 2,144' FWL, NE/4 NW/4,  
Section 24, T11S, R14E  
Duchesne County, UT

#### 1. GEOLOGIC SURFACE FORMATION

Green River

#### 2 & 3. ESTIMATED DEPTHS OF IMPORTANT GEOLOGIC MARKERS AND FORMATIONS EXPECTED TO CONTAIN WATER, OIL AND GAS OR MINERALS

<u>Formation</u>	<u>Depth</u>
Green River	Surface
Wasatch	3,350'*
North Horn	5,500'*
Price River	7,350' *
Castlegate	9,950' *
Blackhawk	10,200' *
Mancos	10,900' *
TD	11,500'

\* PROSPECTIVE PAY

#### 4. PROPOSED CASING PROGRAM

All casing used to drill this well will be new casing.

<u>Type</u>	<u>Size</u>	<u>Weight</u>	<u>Grade</u>	<u>Conn.</u>	<u>Top</u>	<u>Bottom</u>	<u>Hole</u>
Surface	9.625"	43.5 ppf	L-80	STC	0'	1,200'	12-1/4"
Production	5.5"	20.0 ppf	P-110	LTC	0'	11,500'	7-7/8"

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## DRILLING PLAN

### 5. OPERATOR'S MINIMUM SPECIFICATIONS FOR PRESSURE CONTROL

Surface hole: No BOPE will be utilized.

Production hole: Prior to drilling out the surface casing shoe, 5,000 psi BOP equipment will be installed. The pipe rams will be operated at least once per day from surface casing depth to total depth. The blind rams will be tested once per day from surface casing depth to total depth if operations permit.

A diagram of the planned BOP equipment for normal drilling operations in this area is attached. As denoted there will be two valves and one check valve on the kill line, two valves on the choke line, and two adjustable chokes on the manifold system. The BOP "stack" will consist of two BOP rams (1 pipe, 1 blind) and one annular type preventer, all rated to a minimum of 5,000 psi working pressure.

The BOP equipment will be pressure tested prior to drilling below the surface casing shoe. All test pressures will be maintained for fifteen (15) minutes without any significant pressure decrease. Clear water will be circulated into the BOP stack and lines prior to pressure testing. The BLM and the state of Utah Division of Oil, Gas and Mining will be notified 24 hours in advance of all BOP pressure tests.

### 6. MUD SYSTEMS

Sufficient mud materials to maintain mud properties, control lost circulation and to contain "kick" will be available at the well site.

<u>Interval</u>	<u>Mud Weight (ppg)</u>	<u>Viscosity</u>	<u>Fluid Loss</u>	<u>Remarks</u>
0 – 40'	8.3 – 8.6	27-40	--	Native Spud Mud
40' – 1,200'	8.3 – 8.6	27-40	15 cc or less	Native/Gel/Lime
1,200' – TD	8.6 – 9.5	38-46	15 cc or less	Potassium Formate

### 7. BLOOIE LINE

- An automatic igniter will not be installed on blooie line. The blooie will have a constant ignition source.
- A "target tee" connection will be installed on blooie line for 90° change of directions for abrasion resistance.
- "Target tee" connections will be a minimum of 50' from wellhead.
- The blooie line discharge will be a minimum of 100' from the wellhead.

### 8. AUXILIARY EQUIPMENT TO BE USED

- Upper Kelly cock; lower Kelly cock will be installed while drilling
- Inside BOP or stab-in valve (available on the rig floor)
- Safety valve(s) and subs to fit all string connections in use
- Mud monitoring will be visually observed

### 9. TESTING, LOGGING AND CORING PROGRAMS TO BE FOLLOWED

Cores	None anticipated.
Testing	None anticipated.
Sampling	30' samples; surface casing to TD Preserve samples all show intervals
Surveys	Run every 1,000' and on trips
Logging	DIL-GR-SP, FDC-CNL-GR-Caliper-Pe-Microlog, Sonic-GR, all TD to base of surface casing, GR through surface casing.

### 10. ANTICIPATED ABNORMAL PRESSURES OR TEMPERATURES EXPECTED

- No abnormal temperature or pressures are anticipated, Bottom Hole Pressure expected at 4980 psi.
- The formations to be penetrated do not contain known H<sub>2</sub>S gas.

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## DRILLING PLAN

### 11. WATER SUPPLY

- No water pipelines will be laid for this well.
- No water well will be drilled for this well.
- Drilling water for this will be hauled on the road(s) shown in Exhibit B
- Water to be used for drilling will be obtained through a direct purchase from Bill Barrett Corporation (BBC) utilizing an existing water well located in Cottonwood Canyon on State Lands: Section 32-T12S-R16E; BBC has previously been granted authorization with SITLA Right of Entry #4534 and Water Right #90-1542.

### 12. CEMENT SYSTEMS

- Surface Casing: 220 sacks Premium Lite Plus + 0.05 lbs/sack Static Free + 2% bwoc Calcium Chloride + 0.25 lbs/sack Cello Flake + 6% bwoc Bentonite + 1% bwoc Sodium Metasilicate + 161.2% Fresh Water;  
Weight: 11.5 ppg  
Yield: 2.84 cu.ft/sack  
209 sacks Type III Cement + 2% bwoc Calcium Chloride + 0.25 lbs/sack Cello Flake + 60.5% Fresh Water.  
Weight: 14.5 ppg  
Yield: 1.41 cu.ft/sack  
Cement will be circulated to surface with 100% excess
- Production Casing: 987 sacks 50:50 Poz:Class G Cement +0.3% bwoc R-3 + 0.25 lbs/sack Cello Flake + 3 lbs/sack Kol Seal + 1% bwoc FL-25 +2% bwoc Bentonite + 3% bwoc Potassium Chloride + 0.75% bwoc EC-1 + 0.2% bwoc Sodium Metasilicate + 69.3% Fresh Water;  
Weight: 13.5 ppg  
Yield: 1.49 cu.ft/sack  
Cement will be placed in two stages through the use of a stage tool. Depth determined based on potential pay sections, estimated at 4000 ft.  
421 sacks Class G cement + 0.05% bwoc R-3 + 44.3% Fresh Water.  
Weight: 15.8 ppg  
Yield: 1.15 cu.ft/sack  
Top of cement to be determined by log and sample evaluation; estimated TOC 2,850'.  
Volume is log caliper +10%

### 13. ANTICIPATED STARTING DATE AND DURATION OF THE OPERATIONS

Starting Date: May 1, 2007  
Duration: 35 days, drilling and 40 days completion

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## **SURFACE USE PLAN**

### *Attachment for Permit to Drill*

**Name of Operator:** Petro-Canada Resources (USA), Inc.  
**Address:** 1099 – 18<sup>th</sup> Street, Suite 400  
Denver, CO 80202  
**Well Location:** Rye Patch Fed 24-21  
606' FNL & 2,144' FWL, NE/4 NW/4,  
Section 24, T11S, R14E  
Duchesne County, UT

The dirt contractor will be provided with an approved copy of the surface use plan of operations before initiating construction.

An off-lease federal right-of-way is being requested with this application and is necessary for an access and pipeline corridor to the existing federal lease UTU-084317. No other surface use is necessary.

The BLM onsite inspection for the referenced well was conducted on Wednesday, November 1, 2006 at approximately 1:50 pm. In attendance at the onsite inspections were the following individuals:

Scott Ackerman	Natural Resource Specialist	Bureau of Land Management – Vernal
Brandon MacDonald	Wildlife Biologist	Bureau of Land Management – Vernal
Brandon Bowthorpe	Surveyor	Uintah Engineering & Land Surveying
Carla Konopka	Land Manager	Petro-Canada Resources (USA), Inc.
Don Hamilton	Agent	Buys & Associates, Inc.

1. **Existing Roads:**

- a. The proposed well site is located approximately 26.92 miles southwest of Myton, Utah.
- b. The use of roads under State and County Road Department maintenance are necessary to access the Rye Patch area. An encroachment to leave the Duchesne County maintained Wells Draw Road (CR 32) is necessary and will be applied for and approved once the federal permits are in place.
- c. All existing roads will be maintained and kept in good repair during all phases of operation.
- e. Vehicle operators will obey posted speed restrictions and observe safe speeds commensurate with road and weather conditions.
- f. An off-lease federal right-of-way is necessary for the off-lease portions of the access road and pipeline corridor trending east from the north line of Section 24, T11S, R14E. An off-lease federal right-of-way grant is being requested with this application.

2. Planned Access Roads:

- a. From the existing gravel surfaced Duchesne County maintained Wells Draw Road (CR-32), the existing native bladed-surface Rye Patch access road trending west will be upgraded for approximately 4.8 miles to an existing two-track road that will proceed south 110'.
- b. From the existing Rye Patch access road a new access is proposed trending southwest for approximately 0.1 miles. The spur access consists of entirely new disturbance and crosses no significant drainages.
- c. A road design plan is not anticipated at this time.
- d. The proposed access road will consist of a 22' travel surface within a 30' disturbed area across entirely BLM managed lands.
- e. BLM approval to upgrade the existing access corridor and construct the new access corridor is requested with this application.
- f. A maximum grade of 10% will be maintained throughout the project.
- g. No turnouts are proposed.
- h. No low water crossings and one 18' culvert at the spur road intersection with the Rye Patch road is anticipated. Additional culverts and adequate drainage structures will be incorporated into the remaining existing road.
- i. No surfacing material will come from federal or Indian lands.
- j. No gates or cattle guards are anticipated at this time.
- k. Surface disturbance and vehicular travel will be limited to the approved location access road.
- l. All access roads and surface disturbing activities will conform to the standards outlined in the Bureau of Land Management and Forest Service publication: Surface Operating Standards for Oil and Gas Exploration and Development, (1989).
- m. The operator will be responsible for all maintenance of the access road including drainage structures.

3. Location of Existing Wells:

- a. No existing wells are located within a one mile radius of the proposed well.

4. Location of Production Facilities:

- a. All permanent structures will be painted a flat, non-reflective Olive Black to match the standard environmental colors. All facilities will be painted within six months of installation. Facilities required to comply with the Occupational Safety and Health Act (OSHA) may be excluded.
- b. Site security guidelines identified in 43 CFR 3163.7-5 and Onshore Oil and Gas Order No. 3 will be adhered to.
- c. A gas meter run will be constructed and located on lease within 500 feet of the wellhead.

Meter runs will be housed and/or fenced. All gas production and measurement shall comply with the provisions of 43 CFR 3162. 7-3, Onshore Oil and Gas Order No. 5, and American Gas Association (AGA) Report No. 3.

- d. A two-tank battery will be constructed on this lease, it will be surrounded by a dike of sufficient capacity to contain the storage capacity of the largest tank. All loading lines and valves will be placed inside the berm surrounding the tank battery. All liquid hydrocarbons production and measurement shall conform to the provisions of 43 CFR 3162.7-3 and Onshore Oil and Gas Order No. 4 and Onshore Oil and Gas Order No. 5 for natural gas production and measurement.
- e. Any necessary pits will be properly fenced to prevent any wildlife and livestock entry.
- f. All access roads will be maintained as necessary to prevent erosion and accommodate year-round traffic. The road will be maintained in a safe useable condition.
- g. The site will require periodic maintenance to ensure that drainages are kept open and free of debris, ice, and snow, and that surfaces are properly treated to reduce erosion, fugitive dust, and impacts to adjacent areas.
- h. A gas pipeline is associated with this application and is being applied for at this time. The proposed gas pipeline corridor will leave the north side of the well site and traverse 510' north to the proposed Rye Patch 22-44 pipeline corridor.
- i. The new gas pipeline will be a 10" or less steel surface pipeline within a 30' wide utility corridor. The use of the proposed well sites and existing access roads will facilitate the staging of the pipeline construction. A new pipeline length of approximately 510' is associated with this well.
- j. Petro-Canada intends on installing the pipeline on the surface by welding many joints into long lengths, dragging the long lengths into position and then completing a final welding pass to join the long lengths together. Petro-Canada intends on connecting the pipeline together utilizing conventional welding technology.

5. Location and Type of Water Supply:

- a. The location and type of water supply has been addressed as number 11 within the previous drilling plan information.

6. Source of Construction Material:

- a. The use of materials will conform to 43 CFR 3610.2-3.
- b. No construction materials will be removed from BLM lands.
- c. If any gravel is used, it will be obtained from a state approved gravel pit.

7. Methods of Handling Waste Disposal:

- a. All wastes associated with this application will be contained and disposed of utilizing approved facilities.
- b. Drill cuttings will be contained and buried on site.
- c. The reserve pit will be located outboard of the location and along the west side of the pad.
- d. The reserve pit will be constructed so as not to leak, break, or allow any discharge.
- e. The reserve pit will be lined with 12 mil minimum thickness plastic nylon reinforced liner material. The liner will overlay a felt liner pad only if rock is encountered during excavation. The pit liner will overlap the pit walls and be covered with dirt and/or rocks to hold it in place. No trash, scrap pipe, etc., that could puncture the liner will be disposed of in the pit. Pit walls will be sloped no greater than 2:1. A minimum 2-foot freeboard will be maintained in the pit at all times during the drilling and completion operation.
- f. The reserve pit has been located in cut material. Three sides of the reserve pit will be fenced before drilling starts. The fourth side will be fenced as soon as drilling is completed, and shall remain until the pit is dry. After the reserve pit has dried, all areas not needed for production will be rehabilitated.
- g. No chemicals subject to reporting under SARA Title III (hazardous materials) in an amount greater than 10,000 pounds will be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completion of the well. Furthermore, no extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, will be used, produced, stored, transported, or disposed of in association with the drilling, testing, or completion of the well.
- h. Trash will be contained in a trash cage and hauled away to an approved disposal site as necessary but no later than at the completion of drilling operations. The contents of the trash container will be hauled off periodically to the approved Uintah County Landfill near Vernal, Utah.
- i. Produced fluids from the well other than water will be produced into a test tank until such time as construction of production facilities is completed. Any spills of oil, gas, salt water or other produced fluids will be cleaned up and removed.
- j. After initial clean-up, a 400 bbl tank will be installed to contain produced waste water. This water will be transported from the tank to an approved disposal well for disposal near Roosevelt, Utah.
- k. Any salts and/or chemicals, which are an integral part of the drilling system, will be disposed of in the same manner as the drilling fluid.
- l. Sanitary facilities will be on site at all times during operations. Sewage will be placed in a portable chemical toilet and the toilet replaced periodically utilizing a licensed contractor to transport by truck the portable chemical toilet so that its contents can be delivered to the Vernal Wastewater Treatment Facility in accordance with state and county regulations.



8. Ancillary Facilities:

- a. A complete drilling crew camp is being proposed with this application and will be located central to the project area. A central crew camp will be analyzed in detail within the associated Environmental Assessment.

9. Well Site Layout: (See Exhibit B)

- a. The well will be properly identified in accordance with 43 CFR 3162.6.
- b. Access to the well pad will be from the north.
- c. The pad and road designs are consistent with BLM specification
- d. A pre-construction meeting with responsible company representative, contractors and the BLM will be conducted at the project site prior to commencement of surface-disturbing activities. The pad and road will be construction-staked prior to this meeting.
- e. The pad has been staked at its maximum size of 245' X 290'; however it will be constructed smaller if possible, depending upon rig availability. Should the layout change, this application will be amended and approved utilizing a sundry notice.
- f. All surface disturbing activities, will be supervised by a qualified, responsible company representative who is aware of the terms and conditions of the APD and specifications in the approved plans.
- g. All cut and fill slopes will be such that stability can be maintained for the life of the activity.
- h. Diversion ditches will be constructed as shown around the well site to prevent surface waters from entering the well site area.
- i. The site surface will be graded to drain away from the pit to avoid pit spillage during large storm events.
- j. The stockpiled topsoil (first 6 inches or maximum available) will be stored in a windrow on the uphill side of the location to prevent any possible contamination. All topsoil will be stockpiled for reclamation in such a way as to prevent soil loss and contamination.
- k. Pits will remain fenced until site cleanup.
- l. The blooie line will be located at least 100 feet from the well head.
- m. Water injection may be implemented if necessary to minimize the amount of fugitive dust.

10. Plans for Restoration of the Surface (Interim Reclamation and Final Reclamation):

- a. Site reclamation for a producing well will be accomplished for portions of the site not required for the continued operation of the well.
- b. Upon well completion, any hydrocarbons in the pit shall be removed in accordance with 43 CFR 3162.7-1. Once the reserve pit is dry, the plastic nylon reinforced liner shall be torn and perforated before backfilling of the reserve pit. The reserve pit and that portion of the location not needed for production facilities/operations will be re-contoured to the approximate natural contours.

- c. Following BLM published Best Management Practices the interim reclamation will be completed within 90 days of completion of the well to reestablish vegetation, reduce dust and erosion and compliment the visual resources of the area.
  - a. All equipment and debris will be removed from the area proposed for interim reclamation and the pit area will be backfilled and re-contoured.
  - b. The area outside of the rig anchors and other disturbed areas not needed for the operation of the well will be re-contoured to blend with the surrounding area and reseeded at 20 lbs /acre with the following native grass seeds:
    - 1. Blue Bunch Wheat Grass (10 lbs / acre)
    - 2. Rice Grass (10 lbs / acre)
  - c. Reclaimed areas receiving incidental disturbance during the life of the producing well will be re-contoured and reseeded as soon as practical.
- d. The Operator will control noxious weeds along access road use authorizations, pipeline route authorizations, well sites, or other applicable facilities by spraying or mechanical removal. A list of noxious weeds may be obtained from the BLM or the appropriate County Extension Office. On BLM administered land, it is required that a Pesticide Use Proposal be submitted and approved prior to the application of herbicides, pesticides or possibly hazardous chemicals.
- e. Prior to final abandonment of the site, all disturbed areas, including the access road, will be scarified and left with a rough surface. The site will then be seeded and/or planted as prescribed by the BLM. The BLM recommended seed mix will be detailed within their approval documents.

11. Surface and Mineral Ownership:

- a. Surface Ownership – Federal under the management of the Bureau of Land Management - Vernal Field Office, 170 South 500 East, Vernal, Utah 84078; 435-781-4400.
- b. Mineral Ownership – Federal under the management of the Bureau of Land Management - Vernal Field Office, 170 South 500 East, Vernal, Utah 84078; 435-781-4400.

12. Other Information:

- a. Montgomery Archaeological Consultants has conducted a Class III archeological survey. A copy of the pending report will be submitted under separate cover to the appropriate agencies by Montgomery Archaeological Consultants.
- b. Alden Hamblin will conduct a paleontological survey. A copy of the report will be submitted under separate cover to the appropriate agencies by Alden Hamblin.
- c. Our understanding of the results of the onsite inspection are:
  - a. No Threatened and Endangered flora and fauna species were found during the onsite inspection.
  - b. No drainage crossings that require additional State or Federal approval are being crossed.
  - c. The well site is located within an identified MSO polygon which is presently in question by the Vernal BLM. An MSO survey was completed during the spring of 2006 and the second survey will be completed in the spring of 2007, if required. MSO timing restrictions may apply.

13. Operator's Representative and Certification

<u>Title</u>	<u>Name</u>	<u>Office Phone</u>
Company Representative (Denver)	Alan Vrooman	1-303-350-1171
Agent	Don Hamilton	1-435-719-2018

**Certification:**

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access route; that I am familiar with the conditions which currently exists; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by Petro-Canada Resources (USA), Inc. and its contractors and subcontractors in conformity with this APD package and the terms and conditions under which it is approved. I also certify responsibility for the operations conducted on that portion of the leased lands associated with this application, with bond coverage being provided under Petro-Canada's BLM bond. This statement is subject to the provisions of 18 U.S.C. 1001 for the filing of a false statement.

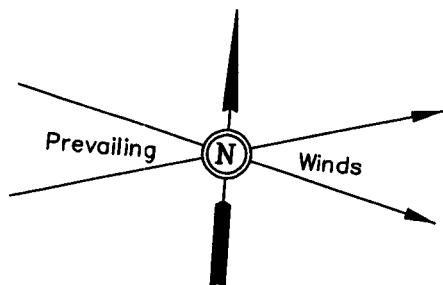
Signature: Don Hamilton Date: 11-20-06

**FIGURE #1**

RYE PATCH #24-21

SECTION 24, T11S, R14E, S.L.B.&M.

606' FNL 2144' FWL

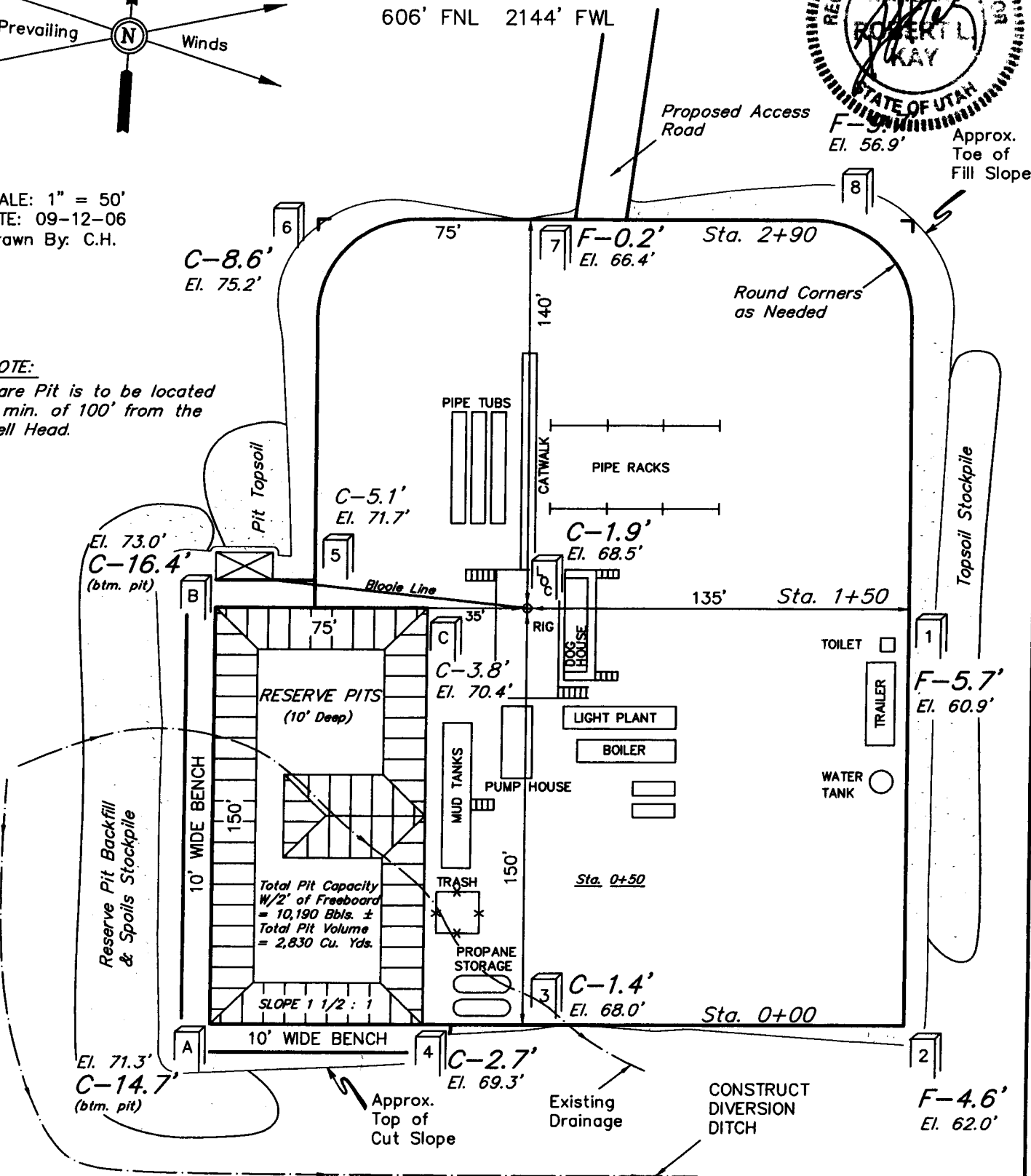


SS  
F-9  
El. 56.9'

Approx.  
Toe of  
Fill Slope

**NOTE:**

*Flare Pit is to be located  
a min. of 100' from the  
Well Head.*



NOTES:

Elev. Ungraded Ground At Loc. Stake = 6968.5'  
FINISHED GRADE ELEV. AT LOC. STAKE = 6966.6'

**UINTAH ENGINEERING & LAND SURVEYING**  
85 So. 200 East \* Vernal, Utah 84078 \* (435) 789-1017

TYPICAL CROSS SECTIONS FOR

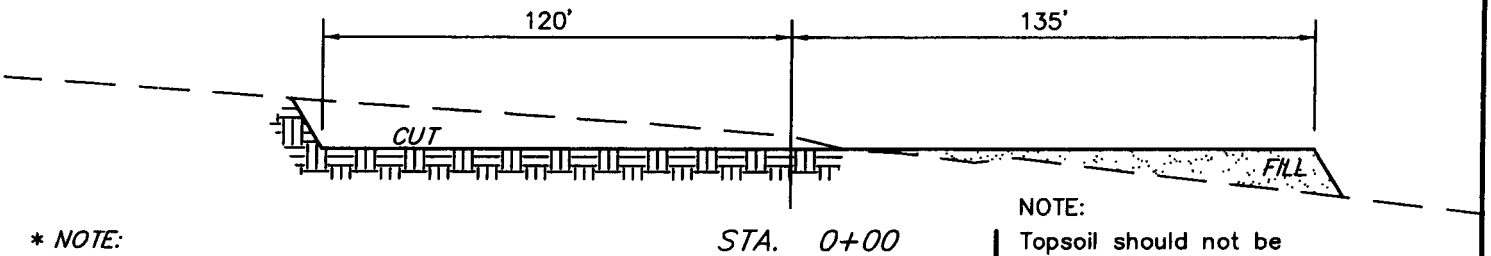
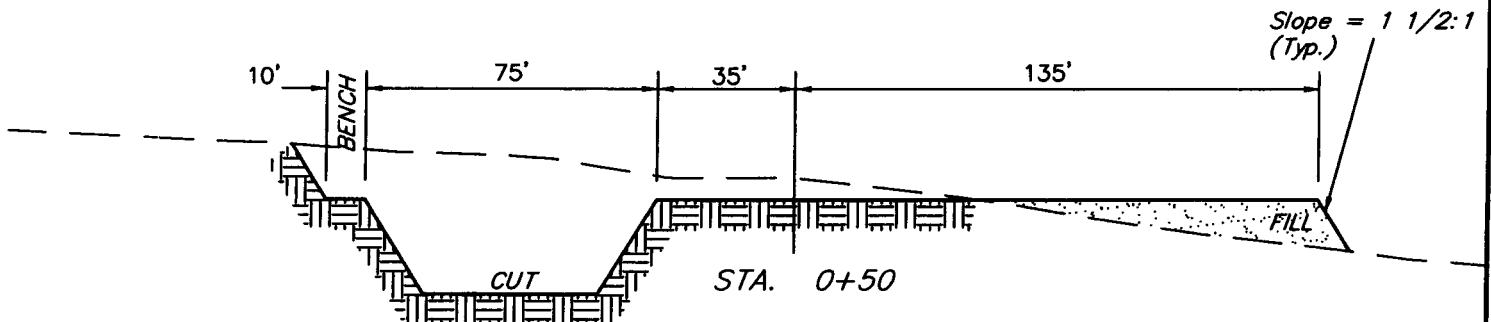
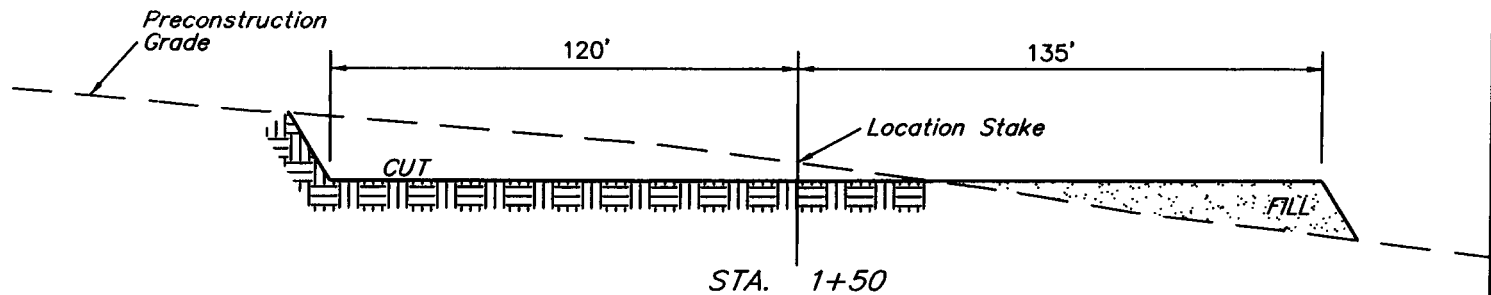
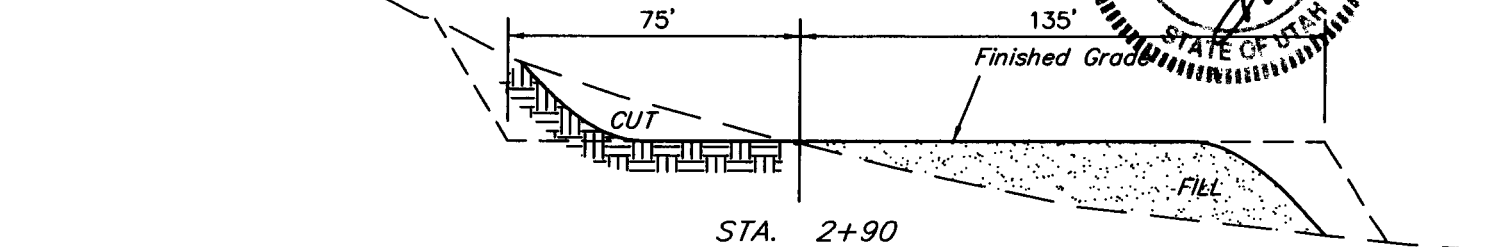
RYE PATCH #24-21

SECTION 24, T11S, R14E, S.L.B.&M.

606' FNL 2144' FWL

1" = 20'  
X-Section  
Scale  
1" = 50'

DATE: 09-12-06  
Drawn By: C.H.



\* NOTE:  
FILL QUANTITY INCLUDES  
5% FOR COMPACTION

NOTE:  
Topsoil should not be  
Stripped Below Finished  
Grade on Substructure Area.

APPROXIMATE YARDAGES

CUT  
(6") Topsoil Stripping = 1,500 Cu. Yds.  
Remaining Location = 7,110 Cu. Yds.  
TOTAL CUT = 8,610 CU.YDS.  
FILL = 5,690 CU.YDS.

EXCESS MATERIAL = 2,920 Cu. Yds.  
Topsoil & Pit Backfill = 2,920 Cu. Yds.  
(1/2 Pit Vol.)  
EXCESS UNBALANCE = 0 Cu. Yds.  
(After Interim Rehabilitation)

UINTAH ENGINEERING & LAND SURVEYING  
85 So. 200 East • Vernal, Utah 84078 • (435) 789-1017

# PETRO-CANADA RESOURCES (USA), INC.

RYE PATCH #24-21

LOCATED IN DUCHESNE COUNTY, UTAH

SECTION 23, T11S, R14E, S.L.B.&M.

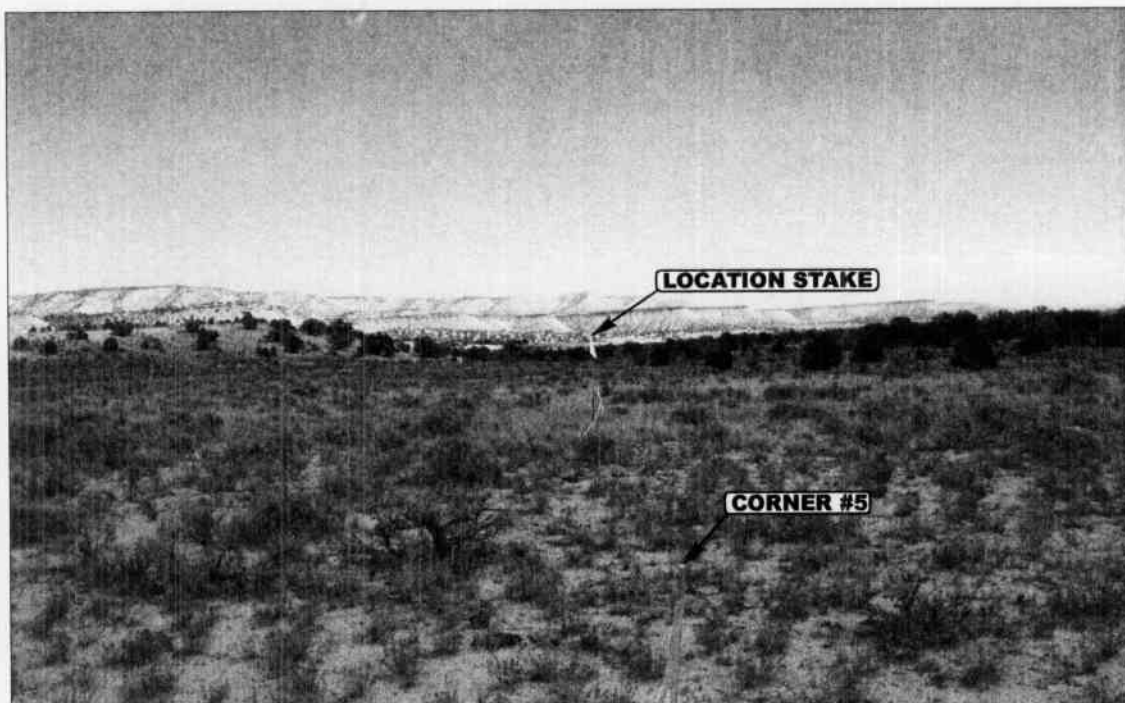


PHOTO: VIEW FROM CORNER #5 TO LOCATION STAKE

CAMERA ANGLE: NORTHEASTERLY



PHOTO: VIEW FROM BEGINNING OF PROPOSED ACCESS

CAMERA ANGLE: SOUTHWESTERLY



- Since 1964 -

UELS

Uintah Engineering & Land Surveying

85 South 200 East Vernal, Utah 84078  
435-789-1017 uels@uelsinc.com

LOCATION PHOTOS

09 13 06  
MONTH DAY YEAR

PHOTO

TAKEN BY: G.O.

DRAWN BY: S.L.

REVISED: 00-00-00



# LEGEND:

○ PROPOSED LOCATION

## PETRO-CANADA RESOURCES (USA), INC.

RYE PATCH #24-21  
SECTION 24, T11S, R14E, S.L.B.&M.  
606' FNL 2144' FWL



Uintah Engineering & Land Surveying  
85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

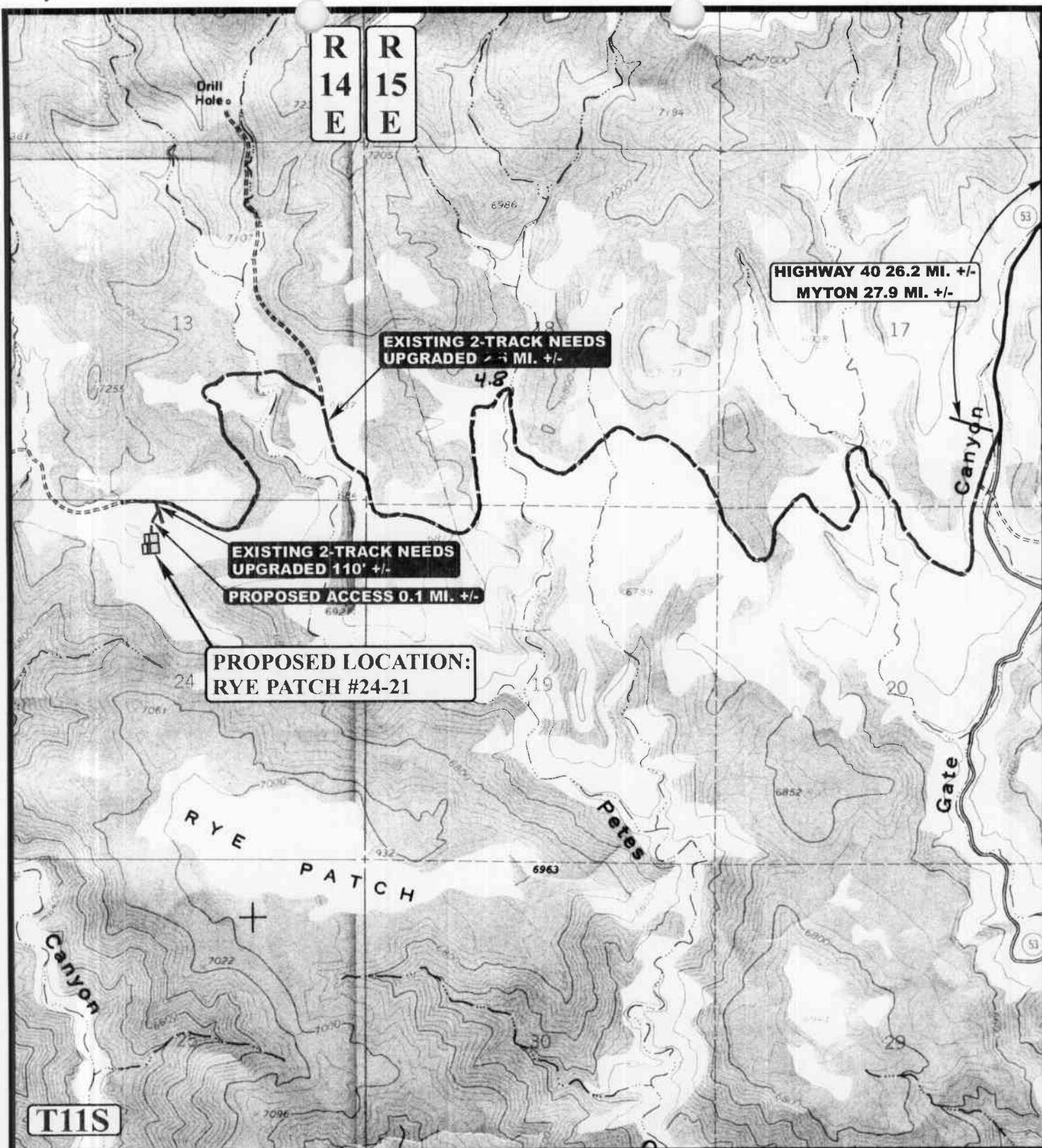
TOPOGRAPHIC  
MAP

09 13 06  
MONTH DAY YEAR

SCALE: 1 : 100,000 DRAWN BY: S.L. REVISED: 00-00-00

A  
TOPO





**T11S**

**LEGEND:**

- PROPOSED ACCESS ROAD
- ===== EXISTING ROAD
- EXISTING 2-TRACK NEEDS UPGRADED



**Uintah Engineering & Land Surveying**  
 85 South 200 East Vernal, Utah 84078  
 (435) 789-1017 \* FAX (435) 789-1813



**PETRO-CANADA RESOURCES (USA), INC.**

**RYE PATCH #24-21**  
**SECTION 24, T11S, R14E, S.L.B.&M.**  
**606' FNL 2144' FWL**

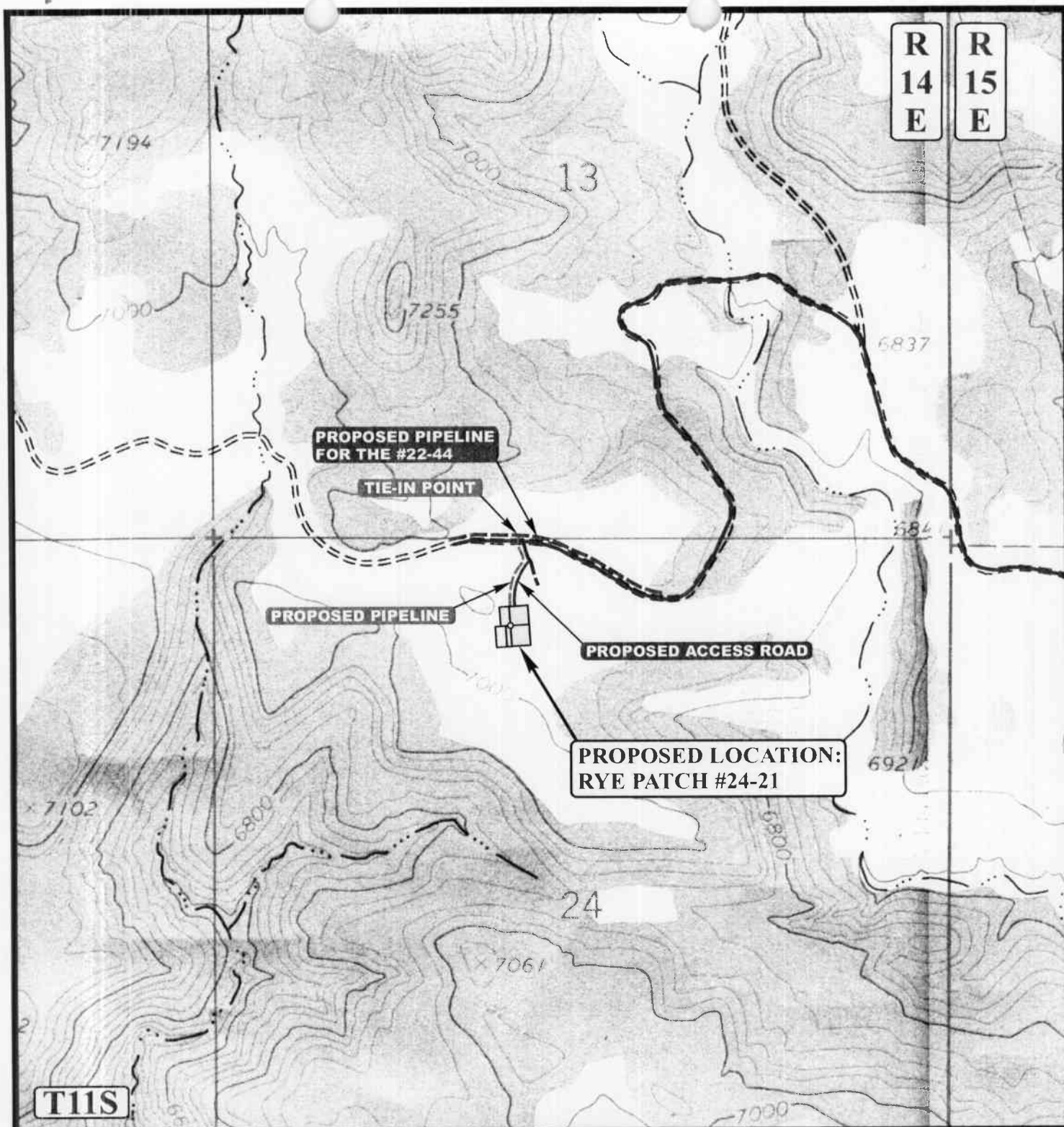
**TOPOGRAPHIC**  
**MAP**

**09 13 06**  
 MONTH DAY YEAR

SCALE: 1" = 2000' | DRAWN BY: S.L. | REVISED: 00-00-00







APPROXIMATE TOTAL PIPELINE DISTANCE = 510' +/-

#### LEGEND:

- PROPOSED ACCESS ROAD
- EXISTING 2-TRACK NEEDS UPGRADED
- PROPOSED PIPELINE
- PROPOSED PIPELINE (SERVICING OTHER WELLS)



**Uintah Engineering & Land Surveying**  
 85 South 200 East Vernal, Utah 84078  
 (435) 789-1017 \* FAX (435) 789-1813



**PETRO-CANADA RESOURCES (USA), INC.**

**RYE PATCH #24-21**  
**SECTION 24, T11S, R14E, S.L.B.&M.**  
**606' FNL 2144' FWL**

**TOPOGRAPHIC**  
**MAP**

**09 13 06**  
 MONTH DAY YEAR

SCALE: 1" = 1000'

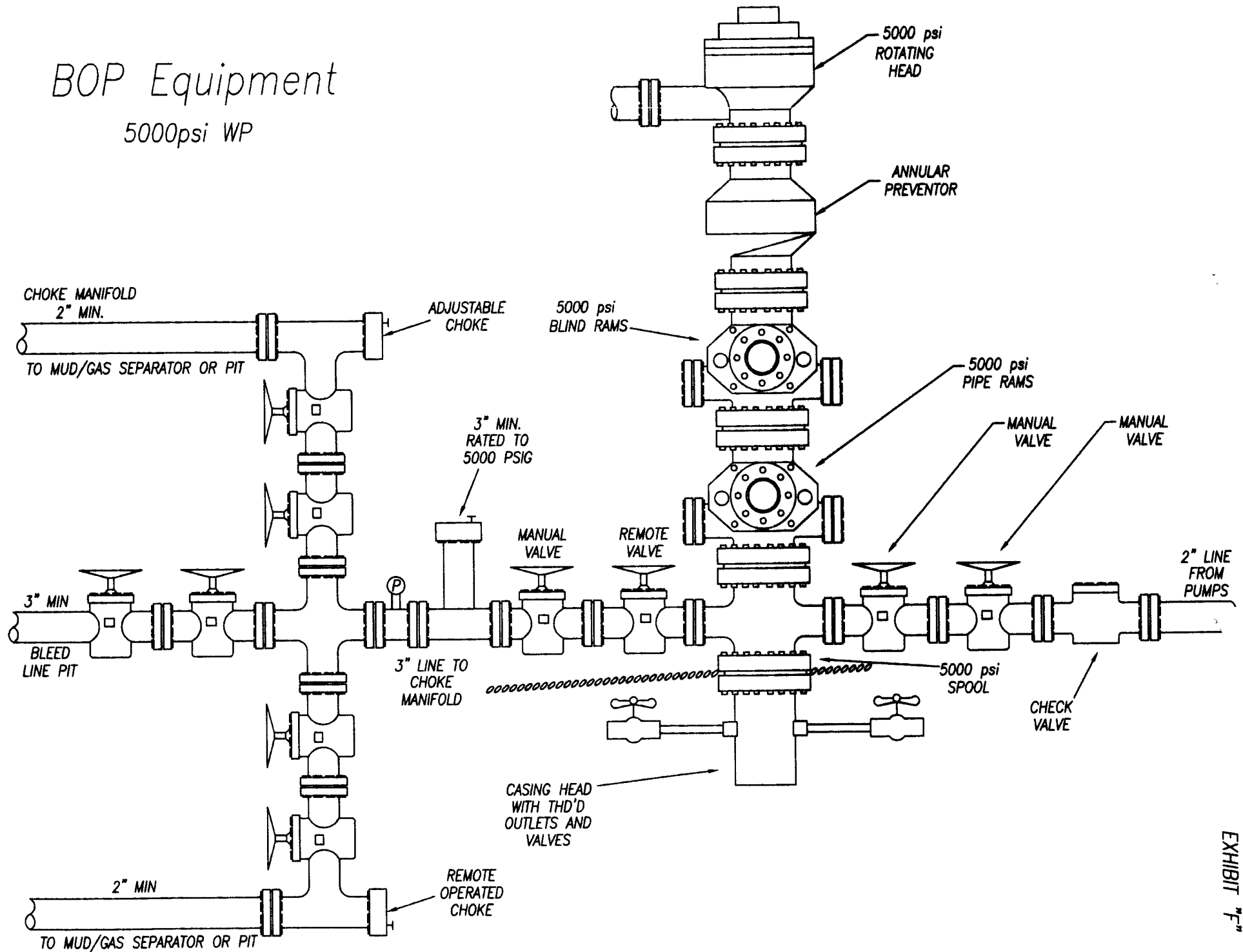
DRAWN BY: S.L.

REVISED: 00-00-00



# BOP Equipment

5000psi WP



**WORKSHEET**  
**APPLICATION FOR PERMIT TO DRILL**

APD RECEIVED: 11/22/2006

API NO. ASSIGNED: 43-013-33443

WELL NAME: RYE PATCH FED 24-21

OPERATOR: PETRO-CANADA RESOURCES ( N2705 )

CONTACT: DON HAMILTON

PHONE NUMBER: 303-350-1171

**PROPOSED LOCATION:**

NENW 24 110S 140E

SURFACE: 0606 FNL 2144 FWL

BOTTOM: 0606 FNL 2144 FWL

COUNTY: DUCHESNE

LATITUDE: 39.84859 LONGITUDE: -110.2971

UTM SURF EASTINGS: 560137 NORTHINGS: 4410979

FIELD NAME: WILDCAT ( 1 )

INSPECT LOCATN BY: / /		
<b>Tech Review</b>	<b>Initials</b>	<b>Date</b>
Engineering		
Geology		
Surface		

LEASE TYPE: 1 - Federal

LEASE NUMBER: UTU-084317

SURFACE OWNER: 1 - Federal

PROPOSED FORMATION: MNCS

COALBED METHANE WELL? NO

**RECEIVED AND/OR REVIEWED:**

- ☒ Plat
- ☒ Bond: Fed[1] Ind[] Sta[] Fee[]  
(No. UT 1215 )
- ☒ Potash (Y/N)
- ☒ Oil Shale 190-5 (B) or 190-3 or 190-13
- ☒ Water Permit  
(No. 90-1542 )
- ☒ RDCC Review (Y/N)  
(Date: )
- ☒ Fee Surf Agreement (Y/N)
- ☒ Intent to Commingle (Y/N)

**LOCATION AND SITING:**

- ☐ R649-2-3.
- Unit: \_\_\_\_\_
- ☒ R649-3-2. General  
Siting: 460 From Qtr/Qtr & 920' Between Wells
- ☐ R649-3-3. Exception
- ☐ Drilling Unit  
Board Cause No: \_\_\_\_\_  
Eff Date: \_\_\_\_\_  
Siting: \_\_\_\_\_
- ☐ R649-3-11. Directional Drill

COMMENTS: \_\_\_\_\_

STIPULATIONS: \_\_\_\_\_

1. *Cedyl Approved*  
2. *Spacing Strip*

T11S R14E

BADLANDS  
CLIFFS UNIT 1  
⬇

T11S R15E

15

14

13

RYE PATCH  
FED 22-21 ⬇

RYE PATCH  
FED 23-22 ⬇

RYE PATCH  
FED 23-11 ⬇

RYE PATCH  
FED 24-21 ⬇

BADLANDS  
CLIFFS U 2 ⬇ RYE PATCH  
FED 22-13

22

23

24

RYE PATCH  
FED 23-32 ⬇

RYE PATCH  
FED 24-31 ⬇

RYE PATCH  
FED 22-44 ⬇

RYE PATCH  
FED 24-43 ⬇

RYE PATCH  
FED 24-44 ⬇

27

26

25

STONE CABIN FIELD

OPERATOR: PETRO-CANADA RES (N2705)

SEC: 22,23,24 T.11S R. 14E

FIELD: WILDCAT (001)

COUNTY: DUCHESNE

SPACING: R649-3-2 / GENERAL SITING

#### Field Status

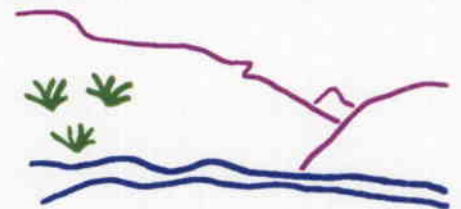
- ABANDONED
- ACTIVE
- COMBINED
- INACTIVE
- PROPOSED
- STORAGE
- TERMINATED

#### Unit Status

- EXPLORATORY
- GAS STORAGE
- NF PP OIL
- NF SECONDARY
- PENDING
- PI OIL
- PP GAS
- PP GEOTHERML
- PP OIL
- SECONDARY
- TERMINATED

#### Wells Status

- ✂ GAS INJECTION
- ✂ GAS STORAGE
- ✂ LOCATION ABANDONED
- ✂ NEW LOCATION
- ✂ PLUGGED & ABANDONED
- ✂ PRODUCING GAS
- ✂ PRODUCING OIL
- ✂ SHUT-IN GAS
- ✂ SHUT-IN OIL
- ✂ TEMP. ABANDONED
- ✂ TEST WELL
- ✂ WATER INJECTION
- ✂ WATER SUPPLY
- ✂ WATER DISPOSAL
- ✂ DRILLING



*Utah Oil Gas and Mining*



PREPARED BY: DIANA MASON  
DATE: 29-NOVEMBER-2006



## State of Utah

### Department of Natural Resources

MICHAEL R. STYLER  
*Executive Director*

### Division of Oil, Gas & Mining

JOHN R. BAZA  
*Division Director*

JON M. HUNTSMAN, JR.  
*Governor*

GARY R. HERBERT  
*Lieutenant Governor*

November 29, 2006

Petro-Canada Resources (USA), Inc.  
1099-18th Street, Suite 400  
Denver, CO 80202

Re: Rye Patch Federal 24-21 Well, 606' FNL, 2144' FWL, NE NW, Sec. 24,  
T. 11 South, R. 14 East, Duchesne County, Utah

Gentlemen:

Pursuant to the provisions and requirements of Utah Code Ann. § 40-6-1 *et seq.*, Utah Administrative Code R649-3-1 *et seq.*, and the attached Conditions of Approval, approval to drill the referenced well is granted.

This approval shall expire one year from the above date unless substantial and continuous operation is underway, or a request for extension is made prior to the expiration date. The API identification number assigned to this well is 43-013-33443.

Sincerely,

Gil Hunt  
Associate Director

pab  
Enclosures

cc: Duchesne County Assessor  
Bureau of Land Management, Vernal District Office

**Operator:** Petro-Canada Resources (USA), Inc.  
**Well Name & Number** Rye Patch Federal 24-21  
**API Number:** 43-013-33443  
**Lease:** UTU-084317

**Location:** NE NW                      **Sec.** 24                      **T.** 11 South                      **R.** 14 East

### **Conditions of Approval**

**1. General**

Compliance with the requirements of Utah Admin. R. 649-1 *et seq.*, the Oil and Gas Conservation General Rules, and the applicable terms and provisions of the approved Application for permit to drill.

**2. Notification Requirements**

Notify the Division within 24 hours of spudding the well.

- Contact Carol Daniels at (801) 538-5284.

Notify the Division prior to commencing operations to plug and abandon the well.

- Contact Dan Jarvis at (801) 538-5338

**3. Reporting Requirements**

All required reports, forms and submittals will be promptly filed with the Division, including but not limited to the Entity Action Form (Form 6), Report of Water Encountered During Drilling (Form 7), Weekly Progress Reports for drilling and completion operations, and Sundry Notices and Reports on Wells requesting approval of change of plans or other operational actions.

**4. State approval of this well does not supersede the required federal approval, which must be obtained prior to drilling.**

**5. This proposed well is located in an area for which drilling units (well spacing patterns) have not been established through an order of the Board of Oil, Gas and Mining (the "Board"). In order to avoid the possibility of waste or injury to correlative rights, the operator is requested, once the well has been drilled, completed, and has produced, to analyze geological and engineering data generated therefrom, as well as any similar data from surrounding areas if available. As soon as is practicable after completion of its analysis, and if the analysis suggests an area larger than the quarter-quarter section upon which the well is located is being drained, the operator is requested to seek an appropriate order from the Board establishing drilling and spacing units in conformance with such analysis by filing a Request for Agency Action with the Board.**

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB No. 1004-0137  
Expires: March 31, 2007

**SUNDRY NOTICES AND REPORTS ON WELLS**

*Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.*

**SUBMIT IN TRIPLICATE- Other instructions on reverse side.**

1. Type of Well <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other		5. Lease Serial No. UTU-084317
2. Name of Operator Petro-Canada Resources (USA), Inc.		6. If Indian, Allottee or Tribe Name N/A
3a. Address 1099-18th Street, Suite 400 Denver, Colorado 80202	3b. Phone No. (include area code) 303-350-1171	7. If Unit or CA/Agreement, Name and/or No. N/A
4. Location of Well (Footage, Sec., T., R., M., or Survey Description) 606' FNL & 2,144' FWL, NE/4 NW/4, Section 24, T11S, R14E, SLB&M		8. Well Name and No. Rye Patch Fed. 24-21
		9. API Well No. 43-013-33443
		10. Field and Pool, or Exploratory Area undesignated
		11. County or Parish, State Duchesne County, Utah

**12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA**

TYPE OF SUBMISSION	TYPE OF ACTION			
<input type="checkbox"/> Notice of Intent	<input type="checkbox"/> Acidize	<input type="checkbox"/> Deepen	<input type="checkbox"/> Production (Start/Resume)	<input type="checkbox"/> Water Shut-Off
<input checked="" type="checkbox"/> Subsequent Report	<input type="checkbox"/> Alter Casing	<input type="checkbox"/> Fracture Treat	<input type="checkbox"/> Reclamation	<input type="checkbox"/> Well Integrity
<input type="checkbox"/> Final Abandonment Notice	<input type="checkbox"/> Casing Repair	<input type="checkbox"/> New Construction	<input type="checkbox"/> Recomplete	<input type="checkbox"/> Other <u>Layout Change</u>
	<input type="checkbox"/> Change Plans	<input type="checkbox"/> Plug and Abandon	<input type="checkbox"/> Temporarily Abandon	
	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Plug Back	<input type="checkbox"/> Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleat horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleat in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Petro-Canada Resources (USA), Inc. has increased the location layout to accommodate a larger rig than initially expected.

Attached please find an updated Location Layout drawing and Typical Cross Sections drawing to replace those previously submitted within Exhibit 'A' of the previously submitted APD. All other aspects of the proposals remain unchanged at this time.

**Accepted by the  
Utah Division of  
Oil, Gas and Mining  
FOR RECORD ONLY**

14. I hereby certify that the foregoing is true and correct Name (Printed/Typed) Don Hamilton		Title Agent for Petro-Canada Resources (USA), Inc.
Signature <u>Don Hamilton</u>		Date <u>7-11-07</u>

**THIS SPACE FOR FEDERAL OR STATE OFFICE USE**

Approved by Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.	Title	Date
	Office	

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

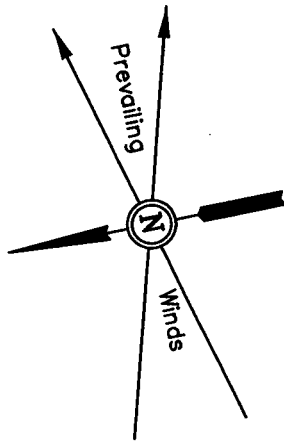
(Instructions on page 2)

**RECEIVED**

**JUL 17 2007**

DIV. OF OIL, GAS & MINING

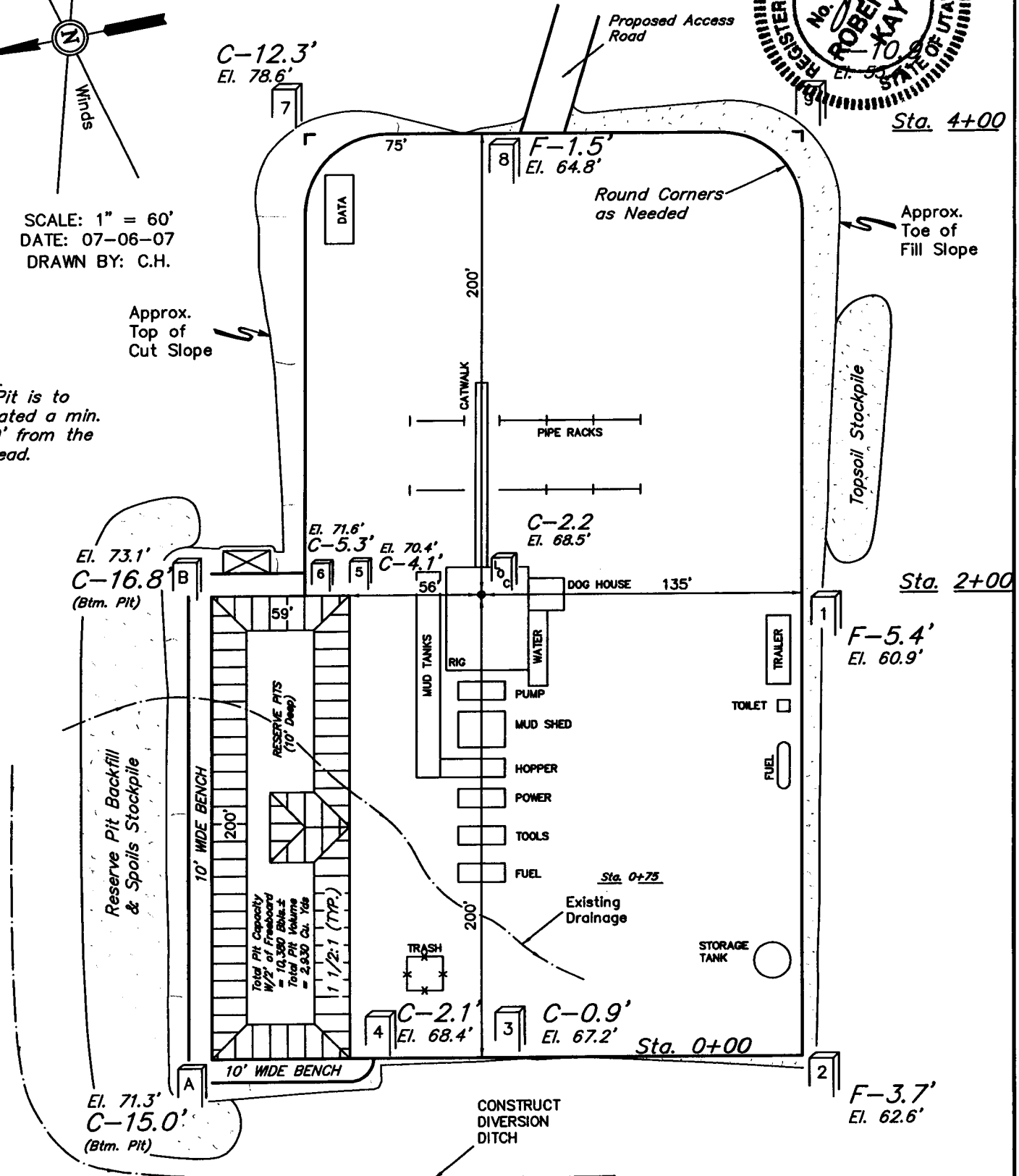
## LOCATION LAYOUT FOR



SCALE: 1" = 60'  
DATE: 07-06-07  
DRAWN BY: C.H.

**NOTE:**

**Flare Pit is to be located a min. of 100' from the Well Head.**



*Elev. Graded Ground at Location Stake* = 6966.3'

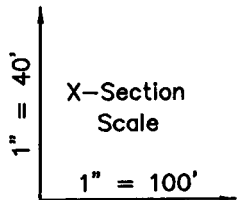
**UINTAH ENGINEERING & LAND SURVEYING**  
85 So. 200 East \* Vernal, Utah 84078 \* (435) 789-1017



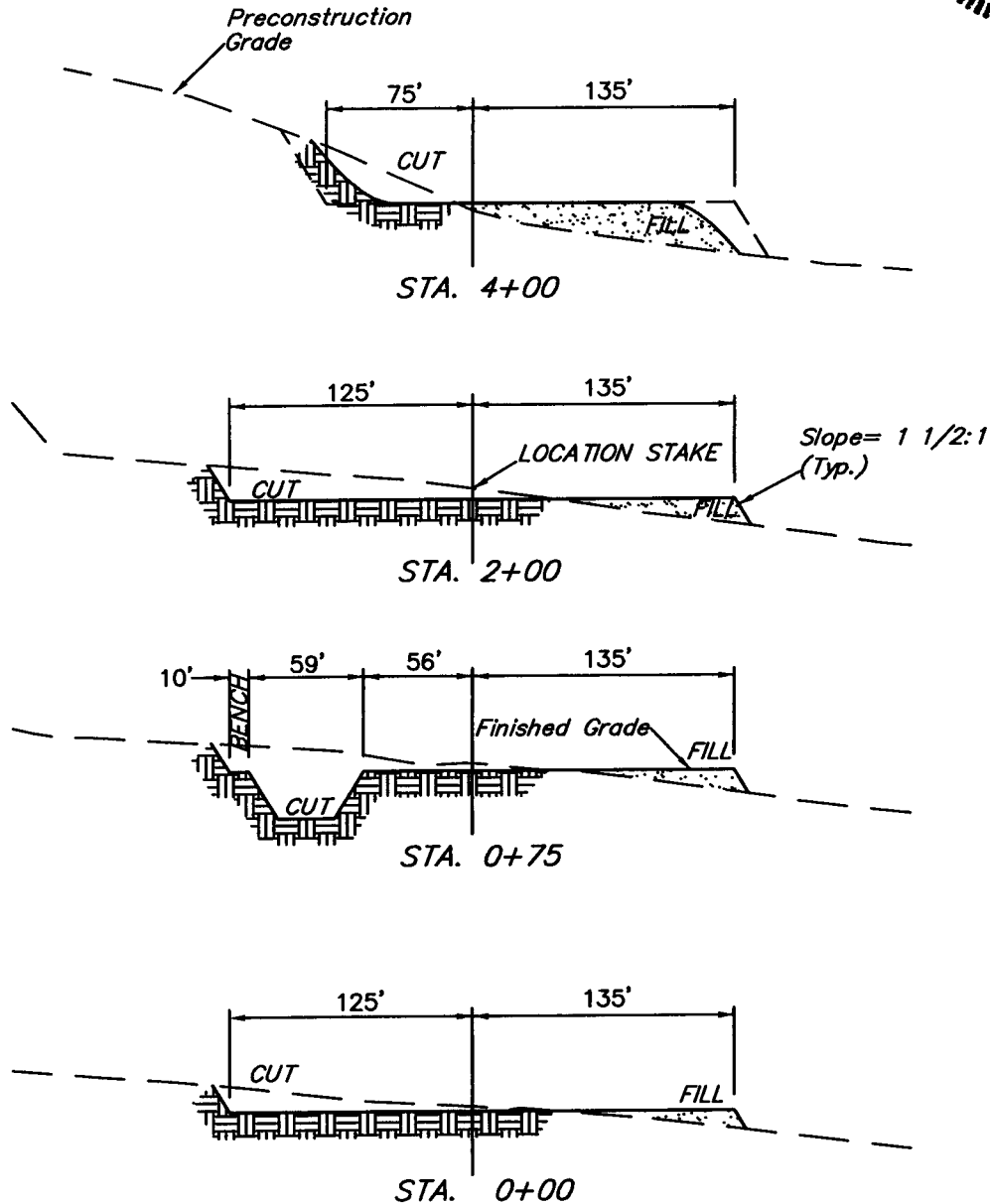
# PETRO-CANADA RESOURCES (USA), INC.

## TYPICAL CROSS SECTIONS FOR

RYE PATCH #24-21  
SECTION 24, T11S, R14E, S.L.B.&M.  
606' FNL 2144' FWL



DATE: 07-06-07  
DRAWN BY: C.H.



### NOTE:

Topsoil should not be Stripped Below Finished Grade on Substructure Area.

### APPROXIMATE YARDAGES

CUT	
(6") Topsoil Stripping	= 2,060 Cu. Yds.
Remaining Location	= 9,560 Cu. Yds.
<b>TOTAL CUT</b>	<b>= 11,620 CU.YDS.</b>
<b>FILL</b>	<b>= 8,090 CU.YDS.</b>

### \* NOTE:

FILL QUANTITY INCLUDES  
5% FOR COMPACTION

EXCESS MATERIAL	= 3,530	Cu. Yds.
Topsoil & Pit Backfill (1/2 Pit Vol.)	= 3,530	Cu. Yds.
EXCESS UNBALANCE (After Interim Rehabilitation)	= 0	Cu. Yds.

UINTAH ENGINEERING & LAND SURVEYING  
85 So. 200 East \* Vernal, Utah 84078 \* (435) 789-1017

RECEIVED

NOV 22 2006

FORM APPROVED  
OMB No. 1004-0137  
Expires March 31, 2007

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

BLM

APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of work: <input checked="" type="checkbox"/> DRILL <input type="checkbox"/> REENTER		5. Lease Serial No. UTU-084317
1b. Type of Well: <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other <input type="checkbox"/> Single Zone <input checked="" type="checkbox"/> Multiple Zone		6. If Indian, Allottee or Tribe Name N/A
2. Name of Operator Petro-Canada Resources (USA), Inc.		7. If Unit or CA Agreement, Name and No. N/A
3a. Address 1099-18th Street, Suite 400 Denver, Colorado 80202		8. Lease Name and Well No. Rye Patch Fed 24-21
3b. Phone No. (include area code) 303-350-1171		9. API Well No. 43.013.33443
4. Location of Well (Report location clearly and in accordance with any State requirements.) At surface 606' FNL & 2,144' FWL, NE/4 NW/4, At proposed prod. zone 606' FNL & 2,144' FWL, NE/4 NW/4,		10. Field and Pool, or Exploratory undesignated
14. Distance in miles and direction from nearest town or post office* 26.92 miles southwest of Myton, Utah		11. Sec., T. R. M. or Blk. and Survey or Area Section 24, T11S, R14E, SLB&M
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 606'	16. No. of acres in lease 1,159.93 acres	17. Spacing Unit dedicated to this well 40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 2,900'	19. Proposed Depth 11,500'	20. BLM/BIA Bond No. on file UT 1215
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 6,969' GR	22. Approximate date work will start* 05/01/2007	23. Estimated duration 35 days drilling 40 days completion

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature <i>Don Hamilton</i>	Name (Printed/Typed) Don Hamilton	Date 11/20/2006
--------------------------------------	--------------------------------------	--------------------

Title  
Agent for Petro-Canada Resources (USA), Inc.

Approved by (Signature) <i>[Signature]</i>	Name (Printed/Typed) TERRY KAWAKA	Date 8-2-2007
---	--------------------------------------	------------------

Title  
Assistant Field Manager  
Lands & Mineral Resources  
Office  
VERNAL FIELD OFFICE

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.  
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

\*(Instructions on page 2)

RECEIVED

AUG 13 2007

DIV. OF OIL, GAS & MINING

CONFIDENTIAL



UNITED STATES DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
VERNAL FIELD OFFICE

170 South 500 East

VERNAL, UT 84078

(435) 781-4400



**CONDITIONS OF APPROVAL FOR APPLICATION FOR PERMIT TO DRILL**

Company: Petro-Canada Resources (USA) Inc. Location: NENW, Sec 24, T11S, R14E  
Well No: Rye Patch Fed. 24-21 Lease No: UTU-84317  
API No: 43-013-33443 Agreement: N/A

Title	Name	Office Phone Number	Cell Phone Number
Petroleum Engineer:	Matt Baker	435-781-4490	435-828-4470
Petroleum Engineer:	Michael Lee	435-781-4432	435-828-7875
Petroleum Engineer:	James Ashley	435-781-4470	435-828-7874
Petroleum Engineer:	Ryan Angus	435-781-4430	435-828-7368
Supervisory Petroleum Technician:	Jamie Sparger	435-781-4502	435-828-3913
NRS/Enviro Scientist:	Paul Buhler	435-781-4475	435-828-4029
NRS/Enviro Scientist:	Karl Wright	435-781-4484	
NRS/Enviro Scientist:	Holly Villa	435-781-4404	
NRS/Enviro Scientist:	Chuck MacDonald	435-781-4441	
NRS/Enviro Scientist:	Jannice Cutler	435-781-3400	
NRS/Enviro Scientist:	Michael Cutler	435-781-3401	
NRS/Enviro Scientist:	Anna Figueroa	435-781-3407	
NRS/Enviro Scientist:	Verlyn Pindell	435-781-3402	
NRS/Enviro Scientist:	Darren Williams	435-781-4447	
NRS/Enviro Scientist:	Nathan Packer	435-781-3405	

Fax: 435-781-4410

**A COPY OF THESE CONDITIONS SHALL BE FURNISHED TO YOUR  
FIELD REPRESENTATIVE TO INSURE COMPLIANCE**

All lease and/or unit operations are to be conducted in such a manner that full compliance is made with the applicable laws, regulations (43 CFR Part 3160), and this approved Application for Permit to Drill including Surface and Downhole Conditions of Approval. The operator is considered fully responsible for the actions of his subcontractors. A copy of the approved APD must be on location during construction, drilling, and completion operations. **This permit is approved for a two (2) year period, or until lease expiration, whichever occurs first. An additional extension, up to two (2) years, may be applied for by sundry notice prior to expiration.**

**NOTIFICATION REQUIREMENTS**

Location Construction (Notify NRS/Enviro Scientist)	-	Forty-Eight (48) hours prior to construction of location and access roads.
Location Completion (Notify NRS/Enviro Scientist)	-	Prior to moving on the drilling rig.
Spud Notice (Notify Petroleum Engineer)	-	Twenty-Four (24) hours prior to spudding the well.
Casing String & Cementing (Notify Supervisory Petroleum Technician)	-	Twenty-Four (24) hours prior to running casing and cementing all casing strings
BOP & Related Equipment Tests (Notify Supervisory Petroleum Technician)	-	Twenty-Four (24) hours prior to initiating pressure tests
First Production Notice (Notify Petroleum Engineer)	-	Within Five (5) business days after new well begins or production resumes after well has been off production for more than ninety (90) days

***SURFACE USE PROGRAM  
CONDITIONS OF APPROVAL (COAs)***

**General Surface COAs**

- If there is an active Gilsonite mining operation within 2 miles of the well location, operator shall notify the Gilsonite operator at least 48 hours prior to any blasting during construction.

**Specific Surface COAs**

- Within 90 calendar days of the approval date for this Application for Permit to Drill (APD), the operator/lessee shall submit to the Authorized Officer (AO), on Sundry Notice Form 3160-5, an Interim Surface Reclamation Plan for surface disturbance on well pads, access roads, and pipelines. At a minimum, this will include the reshaping of the pad to the original contour to the extent possible; the respreading of the top soil up to the rig anchor points; and, the area reseeded using appropriate reclamation methods. The AO will provide written approval or concurrence within 30 calendar days of receipt. During interim management of the surface, use the following seed mix:
- 10 lbs of Indian Ricegrass and 10 lbs of Bluebunch Wheatgrass.
- All the culverts will be installed according to the BLM Gold Book.
- The road and well pad will have road base on the surface.
- Bury pipeline at all low water crossings.
- Permission from an authorized BLM representative will be required if construction or other operations occur during wet conditions that will lead to excessive rutting.
- Permission to clear all wildlife stipulations will only be approved by the BLM wildlife biologist during the specific timing for the species potentially affected by this action.
- In an effort to ensure that project activities do not increase the existence of invasive or noxious weeds in the Project Area, prior to construction activities, all proposed areas of disturbance will be surveyed for the presence of noxious weeds. Results of these surveys will be included in the project record.
- Road crossings of ephemeral drainages at ten locations within the Project Area will be upgraded and armored with rock to minimize erosion. The locations, pre- and post-construction photos, and typical design sketches of these improved crossings will be provided to the U.S. Army Corps of Engineers.
- Petro-Canada will cover all reserve pits with proper netting to eliminate the potential exposure of migratory birds to contaminated water. Netting will be present throughout all phases of the project when fluids are present in the reserve pit.
- A qualified paleontologist will monitor all ground-disturbing activities, and, if fossils are found, will report these findings to the BLM. Operations in the area of the discovery will not resume until avoidance recommendation have been made by the BLM, and written authorization to proceed has been received from the BLM AO.

- The project area is proposed within ½ mile of Mexican Spotted Owl habitat. With this occurrence no surface occupancy will be allowed until after the first season of surveys is completed. If no owls are detected after the first season of surveys, then construction and drilling may begin outside of the timing restriction March 15 – June 15. The second season of surveys will still be required for these buffer areas.
- Petro-Canada has committed to shut down construction/drilling operations beginning March 1, 2008 in order to conduct a third year of Mexican Spotted Owl surveys.

## **DOWNHOLE CONDITIONS OF APPROVAL**

### **SITE SPECIFIC DOWNHOLE CONDITIONS OF APPROVAL**

- BOPE shall meet all requirements of Onshore Order #2 including testing requirements.
- The top of the production casing cement shall extend a minimum of 200 feet above the surface casing shoe.
- All casing strings below the conductor shall be pressure tested to 0.22 psi/ft or 1500 psi, whichever is greater, but not to exceed 70% of the internal yield strength of the casing.

**All provisions outlined in Onshore Oil & Gas Order #2 Drilling Operations shall be strictly adhered to.** The following items are emphasized:

### **DRILLING/COMPLETION/PRODUCING OPERATING STANDARDS**

- The spud date and time shall be reported orally to Vernal Field Office within 24 hours of spudding.
- Notify Vernal Field Office Supervisory Petroleum Engineering Technician at least 24 hours in advance of casing cementing operations and BOPE & casing pressure tests.
- Blowout prevention equipment BOPE shall remain in use until the well is completed or abandoned. Closing unit controls shall remain unobstructed and readily accessible at all times. Choke manifolds shall be located outside of the rig substructure.
- All BOPE components shall be inspected daily and those inspections shall be recorded in the daily drilling report. Components shall be operated and tested as required by Onshore Oil & Gas Order No. 2 to insure good mechanical working order. All BOPE pressure tests shall be performed by a test pump with a chart recorder and **NOT** by the rig pumps. Test shall be reported in the driller's log.
- BOP drills shall be initially conducted by each drilling crew within 24 hours of drilling out from under the surface casing and weekly thereafter as specified in Onshore Oil & Gas Order No. 2.
- Casing pressure tests are required before drilling out from under all casing strings set and cemented in place.
- No aggressive/fresh hard-banded drill pipe shall be used within casing.
- **Cement baskets shall not be run on surface casing.**
- The operator must report all shows of water or water-bearing sands to the BLM. If flowing water is encountered it must be sampled, analyzed, and a copy of the analyses submitted to the BLM Vernal Field Office.
- The operator must report encounters of all non oil & gas mineral resources such as Gilsonite, tar sands, oil shale, trona, etc. to the Vernal Field Office, in writing, within 5 working days of each encounter. Each report shall include the well name/number, well location, date and depth

from KB or GL of encounter, vertical footage of the encounter and, the name of the person making the report along with a telephone number should the BLM need to obtain additional information.

- A complete set of angular deviation and directional surveys of a directional well will be submitted to the Vernal BLM office engineer within 30 days of the completion of the well.
- Chronologic drilling progress reports shall be filed directly with the BLM, Vernal Field Office on a weekly basis in sundry, letter format or e-mail to the Petroleum Engineers until the well is completed.
- A cement bond log CBL will be run from the production casing shoe to the top of cement and shall be utilized to determine the bond quality for the production casing. Submit a field copy of the CBL to this office.
- **Please submit an electronic copy of all other logs run on this well in LAS format to UT\_VN\_Welllogs@BLM.gov. This submission will supersede the requirement for submittal of paper logs to the BLM.**
- There shall be no deviation from the proposed drilling, completion, and/or workover program as approved. Safe drilling and operating practices must be observed. Any changes in operation must have prior approval from the BLM Vernal Field Office.

## OPERATING REQUIREMENT REMINDERS:

- All wells, whether drilling, producing, suspended, or abandoned, shall be identified in accordance with 43 CFR 3162.6. There shall be a sign or marker with the name of the operator, lease serial number, well number, and surveyed description of the well.
- In accordance with 43 CFR 3162.4-3, this well shall be reported on the "Monthly Report of Operations" Oil and Gas Operations Report OGOR starting with the month in which operations commence and continue each month until the well is physically plugged and abandoned. This report shall be filed in duplicate, directly with the Minerals Management Service, P.O. Box 17110, Denver, Colorado 80217-0110, or call 1-800-525-7922 303 231-3650 for reporting information.
- Should the well be successfully completed for production, the BLM Vernal Field office must be notified when it is placed in a producing status. Such notification will be by written communication and must be received in this office by not later than the fifth business day following the date on which the well is placed on production. The notification shall provide, as a minimum, the following informational items:
  - Operator name, address, and telephone number.
  - Well name and number.
  - Well location  $\frac{1}{4}$  $\frac{1}{4}$ , Sec., Twn, Rng, and P.M..
  - Date well was placed in a producing status date of first production for which royalty will be paid.
  - The nature of the well's production, i.e., crude oil, or crude oil and casing head gas, or natural gas and entrained liquid hydrocarbons.
  - The Federal or Indian lease prefix and number on which the well is located; otherwise the non-Federal or non-Indian land category, i.e., State or private.
  - Unit agreement and/or participating area name and number, if applicable.
  - Communitization agreement number, if applicable.
- Any venting or flaring of gas shall be done in accordance with Notice to Lessees NTL 4A and needs prior approval from the BLM Vernal Field Office.
- All undesirable events fires, accidents, blowouts, spills, discharges as specified in NTL 3A will be reported to the BLM, Vernal Field Office. Major events, as defined in NTL3A, shall be reported verbally within 24 hours, followed by a written report within 15 days. "Other than Major Events" will be reported in writing within 15 days. "Minor Events" will be reported on the Monthly Report of Operations and Production.
- Whether the well is completed as a dry hole or as a producer, "Well Completion and Recompletion Report and Log" BLM Form 3160-4 shall be submitted not later than 30 days after completion of the well or after completion of operations being performed, in accordance with 43 CFR 3162.4-1. Two copies of all logs run, core descriptions, and all other surveys or data



obtained and compiled during the drilling, workover, and/or completion operations, shall be filed on BLM Form 3160-4. Submit with the well completion report a geologic report including, at a minimum, formation tops, and a summary and conclusions. Also include deviation surveys, sample descriptions, strip logs, core data, drill stem test data, and results of production tests if performed. Samples cuttings, fluid, and/or gas shall be submitted only when requested by the BLM, Vernal Field Office.

- All off-lease storage, off-lease measurement, or commingling on-lease or off-lease, shall have prior written approval from the BLM Vernal Field Office.
- Oil and gas meters shall be calibrated in place prior to any deliveries. The BLM Vernal Field Office Petroleum Engineers will be provided with a date and time for the initial meter calibration and all future meter proving schedules. A copy of the meter calibration reports shall be submitted to the BLM Vernal Field Office. All measurement facilities will conform to the API standards for liquid hydrocarbons and the AGA standards for natural gas measurement. All measurement points shall be identified as the point of sale or allocation for royalty purposes.
- A schematic facilities diagram as required by Onshore Oil & Gas Order No. 3 shall be submitted to the BLM Vernal Field Office within 30 days of installation or first production, whichever occurs first. All site security regulations as specified in Onshore Oil & Gas Order No. 3 shall be adhered to. All product lines entering and leaving hydrocarbon storage tanks will be effectively sealed in accordance with Onshore Oil & Gas Order No. 3.
- Any additional construction, reconstruction, or alterations of facilities, including roads, gathering lines, batteries, etc., which will result in the disturbance of new ground, shall require the filing of a suitable plan and need prior approval of the BLM Vernal Field Office. Emergency approval may be obtained orally, but such approval does not waive the written report requirement.
- No location shall be constructed or moved, no well shall be plugged, and no drilling or workover equipment shall be removed from a well to be placed in a suspended status without prior approval of the BLM Vernal Field Office. If operations are to be suspended for more than 30 days, prior approval of the BLM Vernal Field Office shall be obtained and notification given before resumption of operations.
- Pursuant to Onshore Oil & Gas Order No. 7, this is authorization for pit disposal of water produced from this well for a period of 90 days from the date of initial production. A permanent disposal method must be approved by this office and in operation prior to the end of this 90-day period. In order to meet this deadline, an application for the proposed permanent disposal method shall be submitted along with any necessary water analyses, as soon as possible, but no later than 45 days after the date of first production. Any method of disposal which has not been approved prior to the end of the authorized 90-day period will be considered as an Incident of Noncompliance and will be grounds for issuing a shut-in order until an acceptable manner for disposing of said water is provided and approved by this office.
- Unless the plugging is to take place immediately upon receipt of oral approval, the Field Office Petroleum Engineers must be notified at least 24 hours in advance of the plugging of the well, in order that a representative may witness plugging operations. If a well is suspended or abandoned, all pits must be fenced immediately until they are backfilled. The "Subsequent Report of Abandonment" Form BLM 3160-5 must be submitted within 30 days after the actual plugging of the well bore, showing location of plugs, amount of cement in each, and amount of casing left in hole, and the current status of the surface restoration.

RECEIVED

SEP 05 2007

ENTITY ACTION FORM

DIV. OF OIL, GAS & MINING

Operator: Petro-Canada Resources (USA) Inc  
Address: 1099 18th Street, Suite 400  
city Denver  
state CO zip 80202

Operator Account Number: N 2705

Phone Number: (303) 297-2300

Well 1

API Number	Well Name		QQ	Sec	Twp	Rng	County
013-33443	RYE PATCH FED 24-21		NENW	24	11S	14E	Duchesne
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
A	99999	16367	8/18/2007			9/25/07	
Comments: m NCS							
CONFIDENTIAL							

Well 2

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
Comments:							

Well 3

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
Comments:							

ACTION CODES:

- A - Establish new entity for new well (single well only)
- B - Add new well to existing entity (group or unit well)
- C - Re-assign well from one existing entity to another existing entity
- D - Re-assign well from one existing entity to a new entity
- E - Other (Explain in 'comments' section)

Susan Miller

Name (Please Print)

Signature

Regulatory Analyst

Title

8/31/2007

Date

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL ☐ GAS WELL ☒ OTHER CONFIDENTIAL

2. NAME OF OPERATOR:  
Petro-Canada Resources (USA) Inc

3. ADDRESS OF OPERATOR:  
1099 18th St., Ste. 400 CITY Denver STATE CO ZIP 59101 PHONE NUMBER: (303) 297-2300

4. LOCATION OF WELL

FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M COUNTY: DUCHESNE

QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E STATE: UTAH

5. LEASE DESIGNATION AND SERIAL NUMBER:  
UTU-084317

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:  
N/A

7. UNIT or CA AGREEMENT NAME:  
N/A

8. WELL NAME and NUMBER:  
RYE PATCH FED 24-21

9. API NUMBER:  
43-013-33443

10. FIELD AND POOL, OR WILDCAT:  
undesigned

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input checked="" type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: <u>Spud and Sfc Csg</u>
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada spud the noted well at 2200 hrs on 08/18/2007.

On 08/20/2007 surface casing was run and cemented as follows:  
9-5/8" 36 ppf STC casing set at 1424' GL

Halliburton cemented the casing with lead of 200 sacks of Rockies-LT SBM followed by tail of 190 sacks of Rockies-LT SBM.

RECEIVED  
SEP 06 2007  
DIV. OF OIL, GAS & MINING

NAME (PLEASE PRINT) Susan Miller

TITLE Regulatory Analyst

SIGNATURE 

DATE 9/4/2007

(This space for State use only)

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

**CONFIDENTIAL**

FORM 9

**SUNDRY NOTICES AND REPORTS ON WELLS**

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 1099 18th St., Ste. 400 City Denver STATE CO ZIP 59101		7. UNIT or CA AGREEMENT NAME: N/A
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M		8. WELL NAME and NUMBER: RYE PATCH FED 24-21
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E		9. API NUMBER: 43-013-33443
COUNTY: DUCHESNE		10. FIELD AND POOL, OR WILDCAT: undesignated
STATE: UTAH		

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input checked="" type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> OTHER: _____
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada requests that the Rye Patch Federal 24-21 well TD be extended from the current permitted depth of 11,500' to 15,500' to test the complete Mancos Shale formation.

**PRODUCTION CASING DESIGN**

Sundry Depth Csg Size Wt ppf Grade Cplg Collapse/SF Burst/SF Tensile/SF BHP Formation

Permitted 11,500' 5.5" 20 P110 LTC 11,100/1.86 12,630/2.11 548/2.78 10.0 Mancos

Proposed 15,500' 5.5" 20 P110 LTC 11,100/1.25 12,630/1.42 548/2.10 11.0 Mancos

Collapse based on 11 ppg pore pressure, full evacuation

Burst based on gas to surface, no back-up

Tension based on buoyed weight in water

**PROPOSED CEMENT DESIGN**

Slurry Type Sx Weight Yelid

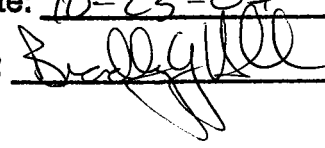
Tail: Premium, 3% KCl, .8% HR322, .2% WG17, 3 pps SilicaLite 3,130 13.4 ppg 1.49 cuft/sx

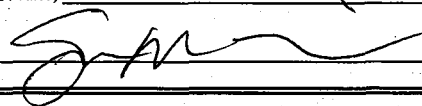
1 pps Granulite

Excess based on 30% over gauge hole, tail into surface pipe.

Approved by the  
Utah Division of  
Oil, Gas and Mining

Date: 10-23-07

By: 

NAME (PLEASE PRINT) Susan Miller	TITLE Regulatory Analyst
SIGNATURE 	DATE 10/4/2007

(This space for State use only)

**Federal Approval of this  
Action is Necessary**

(See Instructions on Reverse Side)

(5/2000)

10-21-07  
Rm

**RECEIVED**  
OCT 10 2007  
DIV. OF OIL, GAS & MINING

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FORM 9

**STATE OF UTAH**  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

**SUNDRY NOTICES AND REPORTS ON WELLS**

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1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 1099 18th St., Ste. 400 CITY Denver STATE CO ZIP 59101		7. UNIT or CA AGREEMENT NAME: N/A
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M		8. WELL NAME and NUMBER: RYE PATCH FED 24-21
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E		9. API NUMBER: 43-013-33443
COUNTY: DUCHESNE		10. FIELD AND POOL, OR WILDCAT: undesignated
STATE: UTAH		

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
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	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: BOPE Change
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada requests authorization to perform the following work on the Rye Patch Federal 24-21 well:

- 1) Set Weatherford L set storm packer (5#M) with "H" valve at 1,400'. POH.
- 2) Nipple down 11" 5#M BOPE.
- 3) Cut off existing 95/8" SOW x 11" 5#M casing head and weld on new 9-5/8" SOW x 11" 10#M casing head.
- 4) NU 11" 10#M stack (Single ram, mud cross, double ram, 5# M annular) and 10#M manifold.
- 5) Test BOPE to 10,000 psi per BLM requirements.
- 6) TIH open H valve, release packer & POH.

COPY SENT TO OPERATOR

Date: 10/24/07  
Initials: [Signature]

NAME (PLEASE PRINT) Susan Miller	TITLE Regulatory Analyst
SIGNATURE [Signature]	DATE 10/9/2007

(This space for State use only)

Accepted by the  
Utah Division of  
Oil, Gas and Mining

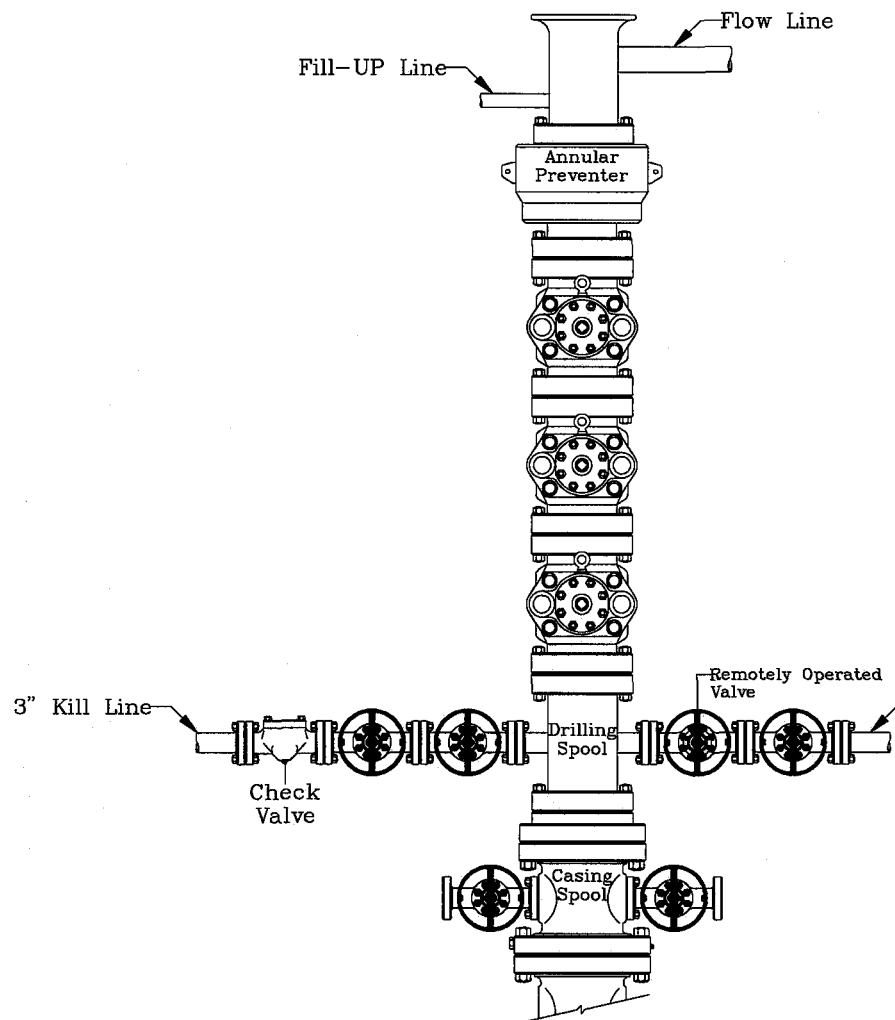
Federal Approval Of This  
Action Is Necessary

**RECEIVED**

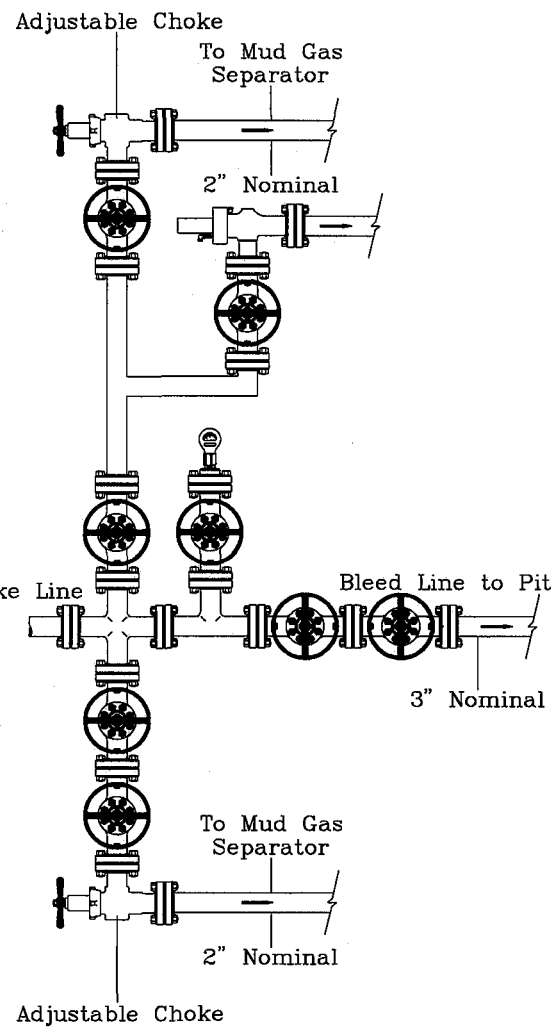
**OCT 11 2007**

DIV. OF OIL, GAS & MINING

TYPICAL 10,000# p.s.i.  
BLOWOUT PREVENTER  
SCHEMATIC



TYPICAL 10,000# p.s.i.  
CHOKE MANIFOLD  
SCHEMATIC



CONFIDENTIAL

## NOTICE

Utah Oil and Gas Conservation General Rule R649-3-21 states that,

- A well is considered completed when the well has been adequately worked to be capable of producing oil or gas or when well testing as required by the division is concluded.
- Within 30 days after the completion or plugging of a well, the following shall be filed:
  - Form 8, Well Completion or Recompletion Report and Log
  - A copy of electric and radioactivity logs, if run
  - A copy of drillstem test reports,
  - A copy of formation water analyses, porosity, permeability or fluid saturation determinations
  - A copy of core analyses, and lithologic logs or sample descriptions if compiled
  - A copy of directional, deviation, and/or measurement-while-drilling survey for each horizontal well

Failure to submit reports in a timely manner will result in the issuance of a Notice of Violation by the Division of Oil, Gas and Mining, and may result in the Division pursuing enforcement action as outlined in Rule R649-10, Administrative Procedures, and Section 40-6-11 of the Utah Code.

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As of the mailing of this notice, the division has not received the required reports for

Operator: Petro-Canada Resources (USA), Inc

Today's Date: 02/14/2008

Well:

API Number:

Drilling Commenced:

Rye Patch Fed 24-21      drlg rpts/wcr

4301333443

08/18/2007

11S    14E    24

To avoid compliance action, required reports should be mailed within 7 business days to:

Utah Division of Oil, Gas and Mining  
1594 West North Temple, Suite 1210  
P.O. Box 145801  
Salt Lake City, Utah 84114-5801

If you have questions or concerns regarding this matter, please call (801) 538-5284.

CONFIDENTIAL

FORM 9

**STATE OF UTAH**  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>		5. LEASE DESIGNATION AND SERIAL NUMBER: <b>UTU-084317</b>
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: <b>N/A</b>
		7. UNIT or CA AGREEMENT NAME: <b>N/A</b>
		8. WELL NAME and NUMBER: <b>RYE PATCH FED 24-21</b>
1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		9. API NUMBER: <b>43-013-33443</b>
2. NAME OF OPERATOR: <b>Petro-Canada Resources (USA) Inc</b>		10. FIELD AND POOL, OR WILDCAT: <b>undesignated</b>
3. ADDRESS OF OPERATOR: <b>999 18th St., Ste. 600</b> CITY <b>Denver</b> STATE <b>CO</b> ZIP <b>80202</b>		PHONE NUMBER: <b>(303) 297-2300</b>
4. LOCATION OF WELL FOOTAGES AT SURFACE: <b>606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&amp;M</b> COUNTY: <b>DUCHESNE</b> QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: <b>NENW 24 11S 14E</b> STATE: <b>UTAH</b>		

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate)  Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only)  Date of work completion: _____	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: <u>Status</u>
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada spud the subject well on 8/24/2007  
 09/24/2007 - drilling ahead  
 10/21/2007 - TD well at 15,500'  
 11/21/2007 - Released drilling rig  
 12/31/2007 - Commenced completion operations  
 01/31/2008 - Flowing to pit  
 02/29/2008 - Flowing and flaring well to pit  
 03/29/2008 - Flow test through separator  
 04/02/2008 - Continue to test well

Attached please find a complete chronological well report.

NAME (PLEASE PRINT) <u>Susan Miller</u>	TITLE <u>Regulatory Analyst</u>
SIGNATURE 	DATE <u>4/3/2008</u>

(This space for State use only)

**RECEIVED**  
**APR 07 2008**  
DIV. OF OIL, GAS & MINING



Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Excalibur Well No. 15718, AFE No. 1714  
Daily Reports  
TIGHT HOLE

08/24/07 PO: WO DAYLIGHT. DAYS FROM SPUD 1. Activity After Midnight: WORKING 12 HRS DURING THE DAY. Status at 0600: WAITING ON DAYLIGHT. Day Plan: RIG DOWN NABORS DRILLING RIG NO. 266 AND MOVE RIG.

08/25/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 2. Activity After Midnight: WORKING 12 HRS DURING THE DAY. Status at 0600: RIGGING DOWN. Day Plan: RIG DOWN MOVE RIG.

08/26/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 3. Activity After Midnight: WORKING 12 HRS DURING THE DAY. Status at 0600: RIGGING DOWN MOVING RIG. Day Plan: RIG DOWN DERRICK, SUB STRUCTURES MOVE DRILL PIPE AND DRILL COLLARS.

08/27/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 4. Activity After Midnight: WAITING ON DAYLIGHTS. Status at 0600: SET DERRICK OFF SUB STRUCTURE. Day Plan: RIG DOWN DERRICK, MOVE SAME, MOVE SUB STRUCTURE, RIG UP ON. NEW LOCATION.

08/28/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 5. RIGGING UP ON LOCATION, MUD TANKS, PUMPS, MOTORS, DIESEL TANK, SCR HOUSE, AND TOP DRIVE HOUSE. ALL SET AND RIGGED UP AND PLASTIC UNDER ALL EQUIPMENT. SUB-STRUCTURE WAS DELIVERED TODAY, 1 CRANE ON LOCATION, DERRICK TO BE BROUGHT IN THE MORNING. WAIT ON DAYLIGHT.

08/29/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 6. PUT SUB TOGETHER, STACK B.O.P.S, & PUT DRAWWORKS ON FLOOR. DERRICK ARRIVED BEGAN ASSEMBLY. WAIT ON DAYLIGHT.

08/30/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 7. PUT DOGHOUSES ON FLOOR. PUT DERRICK TOGETHER & ON FLOOR. SET CATWALK & BLOCKS FOR STRINGUP. STRINGUP BLOCKS. HAULED ALL TUBULAR. GOT RID OF TRUCKS & ONE CRANE. WAIT ON DAYLIGHT.

08/31/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 8. RAISE DERRICK, FINISH RIGGING UP PITS, RIG UP FLOOR, PICK UP TOP DRIVE & RIG UP. NIPPLE UP GAS BUSTER.

09/01/07 PO: WAIT ON DAYLIGHT. DAYS FROM SPUD 9. BUILD B.O.P. STACK. NIPPLE UP & PRESSURE TEST B.O.P.S 5000# HIGH & 250# LOW. FUNCTION TEST ACCUMILATOR. RIG UP FLOOR - TONGS ETC.

**RECEIVED**

**APR 07 2008**

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09/02/07 DAY 10. 1993' (1140'). PO: RIG UP FLOOR, MAKE UP KELLY. PICKED UP B.H.A. PICK UP DRILL PIPE TAG CEMENT 2 1414. DRLG. FLOAT COLLAR, CEMENT SHOE. RUN LEAK OFF TEST - PRESSURE TO 200 HELD 5 MIN. DRLG. FR 1450 TO 1728. RIG SERVICE. DRLG FR 1728 TO 1993.

09/03/07 DAY 11. 3844' (1851'). PO: DRILLING. DRLG. FR 1993 TO 2094. CHANGE OUT WASH PIPE. DRLG. FR 2094 TO 3251. RIG SERVICE. DRLG FR 3251 TO 3844.

09/04/07 DAY 12. 5320' (1476'). PO: DRILLING. DRLG FR 3842 TO 4110. RIG SERVICE. DRLG FR 4110 TO 4870. RIG SERVICE. DRLG FR 4870 TO 5320.

09/05/07 DAY 13. 6056' (736'). PO: DRILLING. DRLG FR 5320 TO 5538. RIG SERVICE TOP DRIVE. DRLG FR 5538 TO 6056.

09/06/07 DAY 14. 6328' (272'). PO: DRILLING. DRLG FR 6056 TO 6228. TRIP OUT OF HOLE FOR BIT & MUD MTR. CHANGE MUD MTR. & BIT TRIP IN HOLE. RIG SERVICE. TRIP IN HOLE - FILL PIPE TEST MUD MTR & WASH BRIDGE @ 3600. TRIP IN HOLE. WASH REAM FR 6165 TO 6228. DRLG FR 6228 TO 6328.

09/07/07 DAY 15. 6862' (534'). PO: DRILLING. DRLG FR 6328 TO 6546. SURVEY & B.O.P. DRILL. DRLG FR 6546 TO 6673. RIG SERVICE. DRLG FR 6673 TO 6862.

09/08/07 DAY 16. 7244' (382'). PO: DRILLING. DRLG FR 6872 TO 7050 AVERAGE ROP - 16.2. RIG SERVICE. DRLG FR 7050 TO 7244 AVERAGE ROP - 15.5.

09/09/07 DAY 17. 7488' (244'). PO: DRILLING. DRLG. FR 7244 TO 7488. CIRC BOTTOMS UP MIX PILL & PUMP. TRIP OUT OF HOLE, HOLE TIGHT @ 7200 TO 7380. CHANGE BIT, PICKUP TORQUE BUSTER, WORK ON FLOWLINE. TRIP IN HOLE.

09/10/07 DAY 18. 7817' (329'). PO: DRILLING. TRIP IN HOLE. WASH & REAM FR. 6580 TO 7488. DRLG FR 7488 TO 7817 WITH TORQUE BUSTER & MUD MOTOR.

09/11/07 DAY 19. 8348' (531'). PO: DRILLING. DRLG FR 7817 TO 8007. RIG SERVICE. DRLG FR 8007 TO 8348.

09/12/07 DAY 20. 8795' (447'). PO: DRILLING. DRLG FR 8348 TO 8669. RIG SERVICE. DRLG FR 8669 TO 8795.

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09/13/07 DAY 21. 9043' (248'). PO: TOO H. DRLG FR 8795 TO 9043 / SPR# 2 - 50 SPM = 650 PSI / 60 SPM = 850 / 70 SPM = 1150 PSI. M.W. 9.5 @ 8953. TRIP OUT OF HOLE FOR BIT.

09/14/07 DAY 22. 9143' (100'). PO: DRILLING. TRIP OUT OF HOLE. LAY DOWN MUD MTR., CHANGE TORQUE BUSTER & BIT. TRIP IN HOLE TO SHOE. SLIP & CUT DRILLING LINE. TRIP IN HOLE HAD TO WASH & REAM 2000, 4000 & 7000. INSTALL ROTATING HEAD - WASH 25' TO BOTTOM. DRLG FR 9043 TO 99115. RIG SERVICE. DRLG FR 9115 TO 9143.

09/15/07 DAY 23. 9152' (9'). PO: DRILLING. DRLG FR 9143 TO 9148 / WORK TO MAKE DRILL - BIT PRESSURED UP WHEN ON BOTTOM. PUMPED SWEEPS DIDNT HELP. POSSIBLE PROBLEM WITH TORQUE BUSTER. MIX PILL. PUMP PILL TRIP OUT OF HOLE. LAY DOWN TORQUE BUSTER, PICK UP 6-6.5 DC & MUD MTR. RUN BHA IN HOLE. FILL PIPE TEST MUD MOTOR & RIG SERVICE. TRIP IN HOLE. WASH & REAM 36' TO BOTTOM. DRLG FR 9148 TO 9152.

09/16/07 DAY 24. 9233' (81'). PO: DRILLING. DRLG FR 9154 TO 9209. MIX, PUMP PILL, TRIP OUT OF HOLE, FLOW CHECK. CHANGE BITS, RIG SERVICE. TRIP IN HOLE. WASH & REAM 15' TO BOTTOM. DRLG FR 9209 TO 9233.

09/17/07 DAY 25. 9298' (65'). PO: REAM. DRLG FR 9233 TO 9298. TRIP FOR BIT. CHANGE BITS, FUNCTION TEST B.O.P.S, TRIP IN HOLE, REAM 10' TO BOTTOM.

09/18/07 DAY 26. 9405' (107'). PO: TOO H. DRLG FR 9298 TO 9327. RIG SERVICE. DRLG FR 9327 TO 9405 - SPR @ 9327 / 50 SPM - 720 / 60 SPM - 990 PSI / 70 SPM - 1300. MIX & PUMP PILL / TRIP OUT OF HOLE FOR BIT & MUD MOTOR.

09/19/07 DAY 27. 9450' (45'). PO: DRILLING. T.O.O.H. LAY DOWN MUD MOTOR. TRIP IN HOLE. PICK UP HIGH SPEED MOTOR & IMPREG BIT TRIP IN HOLE TO SHOE. SLIP & CUT DRILL LINE. TRIP IN HOLE. REAM FR 9044 TO 9405. DRLG FR 9405 TO 9424. SERVICE RIG. DRLG FR 9424 TO 9450.

09/20/07 DAY 28. 9590' (140'). PO: DRILLING. DRLG FR 9450 TO 9519. RIG SERVICE. DRLG FR 9519 TO 9590.

09/21/07 DAY 29. 9749' (159'). PO: DRILLING. DRLG FR 9590 TO 9709. RIG SERVICE & SURVEY @ 9709 - 2 DEGREES. DRLG WITH IMPREG FR 9709 TO 9749.

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09/22/07 DAY 30. 9855' (106'). PO: DRILLING. DRLG WITH IMPREG FR 9785 TO 9804. RIG SERVICE. DRLG FR 9804 TO 9855.

09/23/07 DAY 31. 9890' (35'). PO: DRILLING. DRLG WITH IMPREG FR 9855 TO 9883. 80% SHALE 18% SILTSTONE 2% SANDSTONE. MIX AND PUMP PILL. TRIP OUT OF HOLE. LAY DOWN IMPREG, MUD MOTOR & IBS. MAKE UP BIT , MUD MOTOR & TRIP IN HOLE. WASH & REAM 15' TO BOTTOM. DRLG FR 9883 9890.

09/24/07 DAY 32. 10,022' (132'). PO: TIH. DRLG FR 9890 TO 9993. RIG SERVICE. DRLG FR 9993 TO 10022. MIX PILL & PUMP TRIP OUT OF HOLE. CHANGE OUT BITS TRIP IN HOLE.

09/25/07 DAY 33. 10,099' (77'). PO: TRIP FOR B IT. TRIP IN HOLE. REAM FROM 10000 TO 10022. DRLG FR 10022 TO 10088. RIG SERVICE. DRLG FR 10088 TO 10099. TRIP FOR BIT.

09/26/07 DAY 34. 10,199' (100'). PO: DRILLING. TRIP IN HOLE. REAM FR 10090 TO 10099. DRLG FR 10099 TO 10199.

09/27/07 DAY 35. 10,410' (211'). PO: DRILLING. DRLG FR 10199 TO 10279. RIG SERVICE. DRLG FR 10279 TO 10410.

09/28/07 DAY 36. 10,523' (113'). PO: DRILLING. DRLG FR 10410 TO 10438. TRIP FOR BIT - lay down mud motor. PICK UP MUD MOTOR TRIP IN HOLE TO SHOE. SLIP & CUT DRILLING LINE. RIG SERVICE. FINISH TRIP IN HOLE. WASH 63' TO BOTTOM. DRLG FR 10438 TO 10523.

09/30/07 DAY 37. 10,844' (321'). PO: DRILLING. TRIP IN HOLE. DRLG FR 10595 TO 10844.

10/01/07 DAY 38. 10,986' (142'). PO: TEST BOPE. DRLG FR 10844 TO 10945. RIG SERVICE. DRLG FR 10945 TO 10986. TRIP FOR BIT & PRESSURE TEST B.O.P.S.

10/02/07 DAY 39. 11,282' (296'). PO: RAISE MW. Test BOP's, Function testing Accumulator, Bladders bad in back up bottles. Change out Bottles on Accumulator. Install Wear Bushing. Make Up Bit # 14, Mud Motor, Tele-Drift and BHA. Trip in the hole. Fill up the pipe at 1500', 6500' and 10000'. Install Rotating Head Insert rubber. Drilling Ahead from 10986' to 11000', wob 2-5k, rpm 40/63, spm 80, gpm 392. Drilling Ahead from 11000' to 11282', wob 5-15k, rpm 40/63, spm 80 gpm 392. We are raising the mud weight from 9.6 ppg. to 10.1 ppg.

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- 10/03/07 Day 40. 11,997' (715'). PO: DRILLING. Drilling Ahead from 11282' to 11708', wob 10-13k, rpm 40/63, spm 80, gpm 393, rop average 30.4 fph. Ream on every connection. Survey at 11708' 3 degrees. Service Rig. Drilling Ahead from 11708' to 11997', wob 12-14k, rpm 40/63, spm 80, gpm 393, rop average 30.4 fph. Ream on every connection.
- 10/04/07 Day 41. 12,372' (375'). PO: DRILLING. Drilling Ahead from 11997' to 12165', wob 10-15k, rpm 40/63, spm 80, gpm 393, Average rop 28 fph. Ream on every connection. Pump pressure fell off 200 psi. Took a 20 bbl. gain to the pits, Max gas units 9601, Picked up for a flow check, no pressure on the casing, Gas units fell off right away ( 5 minutes ) Flare 2-15'. Circulating through the Gas buster, Bottoms up showed Shale and Sand. Drilling Ahead from 12165' to 12372', wob 14-18k, rpm 40/63, spm 80, gpm 393, Average rop 25.8 fph., Ream on every connection. Venting through the Gas Buster. Flare occasionally 2-8'. Raise Mud Weight from 10.2 ppg. to 10.3 ppg. Took Tele-Drift Surveys at 12146' 2 degrees and 12336' 2 degrees. Rig Service. Drilling Ahead from 12372' to 12598', wob 15-18k, rpm 40/63, spm 80, gpm 393, Average rop 26.5. Ream on every connection. Venting through the Gas Buster. Flare occasionally 2-5'. Raise Mud Weight from 10.3 ppg. to 10.4 ppg., 10 to 20 bbls. of mud losses or seepage for the day. Took Tele-Drift Survey at 12560' 2 degrees. String Weight up 300k slack-off 275k rotating 285k.
- 10/05/07 Day 42. 12,985' (613'). PO: Drilling Ahead from 12598' to 12867', wob 8-19k, rpm 40/63, spm 80, gpm 393, ROP Average 20.6 fph. Ream on every connection, Venting gas. Drilling Ahead from 12867' to 12942', wob 8-19k, rpm 40/63, spm 80, gpm 393, ROP Average 25 fph. Ream on every connection, Going through Gas Buster, Max gas 4435 units, Gained 11 bbls., Flare 10-15' steady, Building Mud weight from 10.4 ppg. to 10.5 ppg., Tele-Drift Survey at 12906' 3 degrees. Service Rig and Top Drive. Drilling Ahead from 12942' to 12985', wob 8-19k, rpm 40/63, spm 80, gpm 393, ROP Average 17.2 fph., Ream on every connection, Drilling through the Gas Buster, Lost 44 bbls. of mud to the hole. Mix and pump 80 bbl. LCM sweep, pump around at reduced pump rate 60 spm., Mixing LCM Raising LCM in system to 10 ppb., We are having to be careful mixing the LCM as every time we get in a hurry it tries to plug at the bit or mud motor. We have the Shale Shakers bypassed.
- 10/06/07 Day 43. 13,258' (273'). PO: Raise mud weight. Circulate and Condition hole with LCM, Mixing and pumping LCM sweeps ( 40 bbls. of mud, 7 sacks of Duro-Gel, 5 Sacks of Fiber Seal, 5 Sacks of Fed Seal, 2 Sacks of Mix-II 13.75 ppb. ) Sweep # 2 ( 40 bbls. of mud, 7 Sacks of Duro-Gel, 5 Sacks of Fiber Seal, 5 Sacks of Fed Seal, 5 Sacks of Wal-Nut coarse, 2 Sacks of Mix-II 19.3 ppb. ). Drilling Ahead from 12985' to 13037', wob 5-20k, rpm 40/63, spm 80, gpm 393, ROP Average 52 fph., Ream on every

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Connection, Flare 10-15', Mixing 16 Sacks of LCM per hour ( 7 Sacks of Fiber Seal, 7 Sacks of Fed-Seal and 2 Sacks of Mix-II ). Service Rig and Top Drive. Drilling Ahead from 13037' to 13258', wob 15-19k, rpm 40/63, spm 80, gpm 393, ROP Average 26 fph., Ream on every connection, Flare 2-8', Mixing 16 Sacks of LCM per hour, Raising Mud weight from 10.5 ppg. to 10.6 ppg.

10/07/07 Day 44. 13,872' (614'). PO: Survey. Drilling Ahead from 13258' to 13609', wob 15-20k, rpm 40/63, spm 80, 2125 psi., gpm 393, ROP Average 24.2 fph., Ream on every connection, Mix and pump LCM sweeps, Raising Mud weight from 10.3 ppg. to 10.5 ppg., Flare 2-8', Tele-Drift Survey at 13576' 3 degrees. Service Rig and Top Drive. Drilling Ahead from 13609' to 13872', wob 15-20k, rpm 40/63, spm 80, 2250 psi., gpm 393, ROP Average 29.2 fph., Ream on every connection, Mix and pump LCM sweeps, Raise Mud weight from 10.5 ppg. to 10.6 ppg., Flare 2-8', Tele-Drift Survey at 13795' 3 degrees, String Weight up 335k slack-off 280k rotating 306k.

10/08/07 Day 45. 14,466' (594'). Po: Drilling ahead. Drilling Ahead from 13872' to 14084', wob 18-21k, rpm 40/63, spm 80, 2475 psi., gpm 393, ROP Average 22.3 fph., Ream on every connection, Flare 2-8', Raise Mud weight from 10.6 ppg. to 10.7 ppg., String weight up 335k slack-off 280k rotating 305k. Service Rig and Top Drive, The rig had fuel problems with the the motors, changed out main fuel hose from the fuel tank. Drilling Ahead from 14084' to 14256', wob 18-22k, rpm 40/63, spm 80, 2550 psi., gpm 393, ROP Average 34.4 fph., Ream on every connection, Flare 2-5', Raise Mud weight from 10.7 ppg. to 10.9 ppg. Rig Repair, #2 Mud pump swab went out, # 1 Mud pump liner wash was plugged up with mud. Drilling Ahead from 14256' to 14371', wob 18-22k, rpm 40/63, spm 80, 2625 psi., ROP Average 32.8 fph., Ream on every connection, Flare 2-8', Raise Mud weight from 10.7 ppg. to 10.9 ppg. Circulate and condition mud, Raising Mud weight from 10.7 ppg. to 10.9 ppg., Flare 2-5' Drilling Ahead from 14371' to 14466', wob 20-22k, rpm 40/63, spm 80, 2650 psi., gpm 393, ROP Average 23.7 fph., Ream on every connection, Flare 2-8', Raise Mud weight from 10.9 ppg. to 11.2 ppg., String weight up 350k slack-off 280k rotating 311k.

10/09/07 Day 46. 14,626' (160'). Working pipe. Drilling Ahead from 14466' to 14626', wob 19-22k, rpm 40/63, spm 80, 2675 psi., ROP Average 26.6 fph., Ream on every connection, Flare 2-8', Raising Mud weight from 10.8 ppg. to 11.2 ppg. Circulating and conditioning mud, Raise mud weight from 11.2 ppg. to 13 ppg., Flare from 2-8' down to 1-3', Pump pressure 2450 psi. to 2850 psi. off bottom, Working pipe every 15 minutes, rotating while not working it, String weight up 325k slack-off 285k rotating off bottom 310k.

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- 10/10/07 Day 47. 14,626' (0'). PO: TOOH. Circulate and condition mud, build mud weight from 13 ppg. to 13.4 ppg., Pump pressure 2975 psi. at 80 spm., Flare 1-3'. Short trip out 11 stands ( 1050' ) String weight up 315k to 345k slack-off 280k to 290k. Mix and pump slug to trip ( 15.2 ppg. ) Check for flow (Ok). Tripping out of the hole, The hole took the right amount of mud, No tight spots. Break Bit # 14, Lay-down Mud Motor and Tele-Drift. Pull Wear Bushing. Pick up Weatherford L-set Packer and H-Valve, inspect carefully (Ok). Trip in the hole to 1270' (13 stands and 1 single ) carefully. Set Packer with 1/2 turn to the left, then pick and pull to 60k over string weight to check, Release from the packer, Pick up to the next tool-joint, Close the pipe rams and pressure up on the casing and the packer to 1300 psi., Hold for 15 minutes (Ok). Trip out of the hole.
- 10/11/07 Day 48. 14,626' (0'). PO: Tightening bolts on the BOP's. Nippling down the BOP's, removing the Rotating head and spool, remove the Annular preventer, Double gate rams, the Mud cross and HCR and manual valves. Cleaning out the Cellar, we had to dig down 1 1/2 feet of cement for the new Well head to fit. Cut off old Well head and dress 9 5/8 casing for the new Well head. Install new Well head and Weld in place. Rig up and test Wellhead seal to 1500 psi. (Ok). Nippling up BOP'S, Install Single gate, Mud cross, HCR and Manual valves ( Kill and Choke line ). Install Double gate rams, Annular preventer and the Rotating head and Spool, Hooking up Hydraulic lines, Tightening the bolts on the BOP'S.
- 10/12/07 Day 49. 14,626' (0'). PO: Test BOPE. Nipple up 10k BOP Stack, Tightening all Bolts, Hooking up all Hydraulic Lines, Flow Line, Kill Line and Choke Line, targeted tee on Choke line was not installed properly so we are rewelding it. We have to add an additional choke to the choke manifold, also we had to fabricate a 2" in line so that we can hook up to the Kill Line on the outside of the subbase. Fill BOP stack with water Door seal on upper pipe rams is leaking, Function test BOP's, Annular Preventer not operating, Troubleshoot problems with Annular preventer, After tracing all the Hydraulic lines it was found that we had several crossed lines. Install Door seals in upper pipe rams, Install choke Line, Working on Installing new choke in choke manifold house. Wait on Testers, Work on choke manifold, install outside line for the Kill line. Rigging up to test BOP's, While tightening pump in sub on a joint of 4 1/2 drillpipe, The Drilling was torquing it up it moved enough to jerk the slips out of the bushings and it fell down the hole. Rig up and Test the Annular Preventers 250 psi. low 5000 psi. high.
- 10/13/07 Day 50. 14,626' (0'). PO: Welding. Test BOP's, Annular Preventer 250 p-si. low to 5000 psi., Fixing leaks. Make up Over shot with 6 5/8" grapple, Trip in the hole to top of fish ( 1245' ) Break circulation work over shot over Fish (1 joint of 4 1/2 drill pipe with Test sub in the top ). Trip out

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of the hole with Fish ( Fish dropped off after 4 stands ). Test BOP's, Upper and Lower pipe rams, Choke line, HCR and Manual valve 250 psi. low ( Hold for 5 minutes ) 10000 psi. high ( Hold for 15 minutes ) Fixing Leak on Choke line armoured hose. Make up Over shot with 6 1/8" grapple, Trip in the hole to the top of the Fish ( 1245' ) Break circulation work over the Fish. Trip out of the hole with the Fish. Lay-down the Fish ( We retrieved all of it ). Test BOP's, Blind rams, Kill line Manual valves and the 2" Line to the outside of the sub base and the Choke Manifold, 250 psi. low ( Hold for 5 minutes ) 10000 psi. high ( Hold for 15 minutes ). Fixing Leaks on the Choke Manifold, Test TIW, Upper and Lower Top Drive and Dart valves 250 psi. low 10000 psi. high. Make up the Packer retrieving tool, Pick up 6 stands of 6 1/4" drill collars. Finish welding and Fabricating Flare and Gas Buster lines as per BLM specifications.

10/14/07 Day 51. 14,626' (0'). PO: Circulating. Finish Welding, Fabricating and installing Flare and Gas Buster from the Choke Manifold. Pick up Packer retrieving tool. Trip in the hole with Packer Retrieving tool, Install Rotating head Insert. Work Packer retrieving tool over H-valve, open sliding sleeve. Break circulation, Circulate gas out from under packer, Pump pressure went from 400 psi. to 2800 psi., Rotating Head Insert started Leaking so we did a Soft shut in and circulated the Gas out through the Choke Manifold, Mud weight in 12 ppg. out 11.1 ppg., Circulated until Mud weight was 12 ppg. in and out, Flare max 25' the flare went out when we got the mud weight to 12 ppg., Shut down pumps for Flow check and it was dead. Release Packer and work to make sure it was loose. Trip out of the hole with the Packer. Lay-down the Packer and the Retrieving tool. Pick up Bit # 15 and the new BHA. Clear floor for trip in. Trip in the hole to 1424'. Slip and Cut Drilling line ( 120' ). Trip for plugged Bit, Trip out of the hole wet, LCM plugged the Float and Totco ring. Trip in with BHA, try to break circulation, Trip out for plugged Bit ( LCM plug ) Removed jets. TIH to 1583', tagged up ( Put 30k on the bit and it would not go down ). Wash and Ream from 1583', wob 2-4k, rpm 35, spm 80, Pump Pressure 750 psi, gpm 393, We lost about 80 bbls. of mud when we first started circulating. We can run in 5 stands then we have to circulate until it cleans up. The mud is 80-100 viscosity 12.7 ppg. coming out. Flare is 5-15', does not flow when we shut the pumps down.

10/15/07 Day 52. 14,650' (24'). PO: Mix LCM. Wash and Ream from 2715' to 6500', wob 2-5k, rpm 35, spm 80, gpm 393, Flare 5-25'. Wash and Ream from 14580' to 14626' ( 46 feet of fill ). Starting Bit ( Bit balled up ) Drilling Ahead from 14626' to 14650', wob 5-25k, rpm 50-90, spm 85, gpm 417, Ream every joint, Mixing LCM (Wal-Nut medium to help unballing ) Rop from 5- 20 fph.



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- 10/16/07 Day 53. 15,049' (399'). PO: Drilling. Drilling Ahead from 14650' to 14808', wob 20-25k, rpm 70-90, spm 80 to 95, Pump pressure 2525 to 2875 psi., gpm 393 to 466, Ream on every Connection, Dumping Gas Buster on every connection because of the LCM build-up. Flare 5-15'. Service Rig and Top Drive. Drilling Ahead from 14808' to 15049', wob 20-30k, rpm 75-100, spm 85 to 100, Pump pressure 2100 to 2900 psi, Ream on every connection, We have stringers of real hard shale, We are having to slow the rpm and spm down as the torque stop the Top drive and pump pressure goes up, We are pumping high viscosity weighted sweeps to deal with this ( 60 viscosity 12.5 ppg. ) Flare 5-15'.
- 10/17/07 Day 54. 15,095' (46'). PO: Drilling. Drilling Ahead from 15045' to 15089', wob 15-20k, rpm 80-100, spm 100, 2650 psi., gpm 491, Reaming on every connection. Flare 5-15'. Circulating and conditioning hole, Mix and pump a weighted high viscosity sweep ( 65 viscosity 13.5 ppg. ) Wash and Reaming through problem spot, Drill string torqued up and stopped when we were changing formations when we went to pick up on it we were starting to pack-off ( Pump pressure went from 2650 psi. to 3100 psi. ). Drilling Ahead from 15089' to 15095', wob 10-20k, rpm 70, spm 95, 2475 psi., gpm 398, Flare 5-15'. Circulating and conditioning hole, It started torquing up and stalling the Top drive, We mixed and pumped a Weighted High viscosity sweep, We can see the improvement when the sweep gets to the bit, Increasing the Mud weight from 12.1 ppg. to 12.3 ppg. ( The cuttings that were coming back over the shaker were larger than normal and slightly splintered ) They have since went back to looking normal. Drilling Ahead from 15095' to 15164', wob 20-25k, rpm 60-80, spm 85, 2350 psi., gpm 356, Ream every joint, Flare 5-10'. Rig and Top Drive. Drilling Ahead from 15164' to 15210', wob 20-30k, rpm 60-75, spm 85, 2350 psi., gpm 398, Ream every joint, Flare 2-6'.
- 10/18/07 Day 55. 15,262' (167'). PO: TIH. Drilling Ahead from 15210' to 15262', 20-25k, rpm 60-75, spm 85, 2375 psi., gpm 417, Ream on every joint, Flare 2-6', Torque 7500 to 10500. Mix and pump pill ( 14 ppg. ) Check for Flow ( Ok ). Trip out of the hole to 4121', Tripping slow, when we try to speed up the hole started swabbing. Working tight spot from 4121' to 4115', Tried to do it without the pump and back reaming, We started the pump and reamed through it several times until it was clean. Trip out of the hole, 30k overpull from 2000' to 1500'. Break BIT # 15 and Make up Bit # 16. Trip in the hole, 20-25k down from 1500'- 2100'.
- 10/19/07 Day 56. 15,337' (75'). PO: Drilling. Trip in the hole to 4250'. Work through tight spot from 4250' to 4345'. Trip in the hole from 4345' to 15189', Fill up the pipe every 25 stands. Wash and Ream from 15189' to 15262', ( 10' of fill ). Drilling Ahead from 15262' to 15285', wob 5-30k, rpm 50-100, spm 80-90, 2250 to 2675 psi, gpm 393 to 442, Flare 2-25' (

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15 to 25' Trip gas on bottoms up ). Service Rig and Top Drive. Drilling Ahead from 15285' to 15337', wob 25-35k, rpm 70, spm 100, 2950 psi, gpm 491, Flare 2-8', Torque 8500 to 15000, Mixing and pumping sweeps periodically to help with possible balling and torque.

- 10/20/07 Day 57. 15,450' (113'). PO: Drilling. Drilling Ahead from 15337' to 15389', wob 20-30k, rpm 70-90, spm 85-100, 2350 to 2975 psi, gpm 417-491, Pumping Graphite diesel sweeps every 30 minutes ( 20 bbls. 5 sacks Contone 1 sack Mix II 15 gallons of Diesel ) Torque 8500 to 12500 Service Rig and Top Drive Repair Mud pumps, Swab and Liner in # 2, Valve and Seat in # 1. Drilling Ahead from 15389' to 15450', wob 20-35k, rpm 75-90, spm 90, 2835 psi., gpm 442, Pumping Graphite diesel sweeps every 30 minutes, Mud weight 12.3 viscosity 41, Torque 5500 to 11000.
- 10/21/07 Day 58. **15,500' TD (50')**. PO: Drilling. Drilling Ahead from 15450' to total depth of 15500', wob 20-35k, rpm 70-90, spm 90, 2875 psi., gpm 442, Flare 2-8', Torque 5500-22900. Circulate up Bottom hole Sample for Mud loggers Mix and pump drill pipe slug ( 14.3 ppg. ) Trip out of the hole to 5848', Strap drill pipe, Pulling slow because hole was trying to swab.
- 10/22/07 Day 59. 15,500' TD (0'). PO: RU WL unit. Short Trip to the 9 5/8 casing shoe, work through tight spots at 4186' to 4091', 2726' to 2721' and 2535' to 2450' ( Over pull 20-30k ). Cut and Slip Drilling line ( 104' ). Adjust Brakes on Drawworks. Trip in the hole to 15405', Fill up every 25 stands, Tight spots took 15-20k down from 1500' to 1975', 2390' to 2550' and 4000' to 4200'. Break circulation Wash and Ream from 15405' to 15500' ( 5' of Fill ). Circulate and Condition hole, Pump high viscosity sweep all the way around, Keep pipe moving all the time, Flare on bottoms up 5-25'. Mix and pump drill pipe slug, Drop Totco survey. Trip out of the hole, Work through tight spots at 4018' to 3855', 2568' to 2504' 1996' to 1470', (Over pull 10-15k ) Back ream through all these areas until clean. Rig up Baker Atlas Wire line unit.
- 10/23/07 Day 60. 15,500' TD (0'). PO: TIH. Rigging up Baker Atlas Wire line Loggers. Running in the hole with Wire line Logs to 2470', could not get past this point, We made several attempts. Rig down Baker Atlas. Make up Bit # RR6. Trip in the hole to 1095'. Trip in the hole to 1583', Tagged up on obstruction (We set 20k on it). Install Rotating Head rubber insert. Wash and Ream from 1583' to 4092', Several spots took weight from 1583' to 1703', 1903' to 2206', 2347' 2541', 2702' to 2838', 4002' 4045', wob 2-10k, rpm 65, spm 90, 1095 psi., gpm 442, Flare 2-6' intermittent. Circulate hole clean (Bottoms up) Mix and pump slug ( 13.4 ppg. ). Trip out of the hole (We only had 2 spots where we had 15k over pull, 2885' and 1936' to 1470'). Break Bit # RR 6. Rig up Baker Atlas Wire line. Run in the hole with Logs, Could not get past 2710', Trip out and Drop

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part of tools off (Shorten it from 120' to 55'). Run in the hole with Logs, tried working past 2710', will not go. Rig down Baker Atlas. Make up Bit # RR 6, Trip in the hole with BHA.

- 10/24/07 Day 61. 15,500' TD. PO: W&R. Make up Bit # RR6, Trip in the hole to 1400'. Install Rotating Head insert, Trip in the hole to 1470'. Wash and Ream from 1470' to 4917', Trouble spots at 2700' to 2816', 2902' to 3101', 3204' to 4109', 4113' to 4203', 4325' 4400', 4600' to 4908'. Trip in the hole to 15380', Fill the pipe every 25 stands. Break Circulation, Wash and Ream from 15380' to 15500' ( 10' of fill ). Circulate and Condition the mud, Raising the mud weight from 12.3 ppg. to 12.8+ ppg., Viscosity from 41 to 50+.
- 10/25/07 Day 62. 15,500' TD. PO: Reciprocate pipe. Circulate and Condition hole, Raising Mud weight 12.9 and Viscosity to 56. Mix and pump 40 bbl pill weight 14.9 ppg. 60 viscosity. Trip out of the hole to 4154'. Wash and Ream from 4154' to 3996', Working through several times until clean. Back ream and wash from 3996' to 2757' ( 5k overpull ). Working stuck pipe at 2757', Cannot rotate, Trapping torque and trying to work it down, Reciprocating pipe from 25k over to 50k down, Full circulation.
- 10/26/07 Day 63. 15,500' TD. PO: Pump Pipe Lax. Working Stuck pipe while waiting on Free-Point and Fisherman. Mix and Spot 30 bbl. Pipe-Lax pill (15 bbl. Diesel, 20 5 gallon buckets of Pipe-Lax 25 bbls of 13 ppg mud, Weight 9 ppg.). Pump 1 bbl every hour. Rig up Wire Line truck to Free-Point, Could not Rig up due to the height of drill pipe above the Rotary table. Perform a manual Back-Off, Find Neutral point and put 5 rounds to the Left. Trip out of the Hole with Fish (Weight 65k). Recovered 1837' (18 stands & 1 Single of 4 1/2 Drill pipe and 4 joints of Heavy-wate). Picking up Fishing BHA, Skirted Screw in sub, Bumper sub, Jars, 6- 6 1/4" Drill collars, 4-4 1/2 Heavy-wate, Accelerator Jars, 16 stands and a double of 4 1/2" Drill pipe. Jarring on Stuck pipe, Tried Knocking it down then Jarring up, String Weight 125k, pulling to 225k (100k lover pull ). Weight Indicator failed but we are still able to work pipe using the Pason, Pump 1 bbl. every hour of Pipe-Lax.
- 10/27/07 Day 64. 15,500' TD. PO: Jar on pipe. Jarring and work stuck pipe (check top drive and derrick) BOTTOM FISH 2757. Continue jarring and work stuck pipe. Spot pipe lax pill from 2757 to 1470. R/U Weatherford wireline truck (free point). Preform freepoint found pipe free at 2235, pull freepoint tool, preform back off at 2123. R/D Weatherford wireline truck. Jarring on backed off pipe max pull 275K max allow by rig toolpusher.

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- 10/28/07 Day 65. 15,500' TD. PO: Pipe stuck. JARRING ON BACK OFF PIPE (2123) NO MOVEMENT Max PULL 300K, STRING WEIGHT 83K, JARRING EVERY 10 MINUTE GOOD ACTION , BROKE CIRC FOR 3 MINUTES SPM 42, PP 477 PSI. R/U WEATHERFORD WIRELINE TRUCK, MAKE UP CCL TOOL AND SINKER BAR AND MAKE DUMIE RUN FOUND PIPE BACK OFF AT 2123, AND CONTINUE TO 2703 TOOL SET DOWN, POOH WITH CCL TOOL, AND RIH W/ FREE POINT AND TOOK CHECK READING AT 1428 PIPE 100% FREE, 1872 PIPE STUCK, 1815 PIPE STUCK, 1754 PIPE STUCK, 1611 PIPE 30% FREE, 1582 PIPE 70 % FREE, CALLED OFFICE, POOH W/ FREE POINT TOOL AND R/D SAME. CIRC. CLEAN SLUG TANK AND PREPARE PIPE LAX PILL (62 BBLs). PUMP 50 BBL OF PIPE LAX AND DISPLACE WITH 24 BBL 12.6 PPG MUD LEFT 4 BBLs OF PIPE LAX IN DRILL PIPE. WAIT ON 50 BBL PIPE LAX PILL TO WORK, (HELD 2 1/2 WRAPS OF TORQUE AND SET WEIGHT DOWN).
- 10/29/07 Day 66. 15,500' TD. PO: JARRING ON PIPE. WAIT ON PIPE LAX TO FREE PIPE. WEIGHT INCREASE ON INDICATOR (WEIGHT), P/U AND WORK JAR MAX PULL 300K, HELD TORQUE ON PIPE WHILE WORKING UP AND DOWN, MOVEMENT 2 FOOT DOWN, POSSIBLE MOVEMENT UP 1 FOOT, STOP JARRING AND WAIT 1 HOURS AND WILL TRY AGAIN. WAIT ON PIPE LAX TO FREE PIPE, WEIGHT DOWN , 2 1/2 TURN TORQUE. PICKL UP ON PIPE W/ TORQUE AND PULL TO MAX 250 JARS OFF NO MOVEMENT, SET BACK DOWN 50 K WITH 2 1/2 TURN OF TORQUE, PUMP 8 SPM , WAIT ON PIPE LAX TO WORK. WAIT ON PIPE LAX TO WORK FREE STUCK PIPE. JARRING ON BACKED OFF PIPE, MAX 250K HOLDING 2 1/2 WRAPS.
- 10/30/07 Day 67. 15,500' TD. PO: BUILD MUD. CONTINUE JARRING DOWN AND UP ON BACKED OFF PIPE, NO MOVEMENT. R/U WEATHERFORD WIRELINE FREE POINT TOOL AND RIH W/ SAME AND BACK OFF AT 2060' (WIRELINE MEASUREMENT) CHECK SHOTS @ 1464 FREE, 1837 FREE, 1861 FREE, 1957 FREE, 2200 STUCK, 2172 STUCK, 2100 FREE, 2090 FREE, 2060 FREE. STRING WEIGHT 83K GOOD ROTATION. PULL OUT HOLE WITH FISH RECOVERED 8 JTS HWDP (SLM 2092) NOTE U TUBING FOR 10 MINUTES. L/D JARS. RIG REPAIRS TOP DRIVE DAMAGE FROM JARRING. MAKE UP FISHING BHA, 1- SCREW IN SUB, 2-6.25 SDC, 1-6.5 DRILLING JAR, 4-6.25 SDC, 11 JTS HWDP AND T.I.H TO SHOE. SLIP AND CUT DRILL LINE 154'. TRANSFER 460 BBLs OF 12.5 PPG (ACTIVE MUD SYSTEM) TO FRAC TANK, START BUILDING 300 BBLs 9.2 PPG MUD IN ACTIVE SYSTEM.

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- 10/31/07 Day 68. 15,500' TD. PO: POOH. CIRC AND BALANCE MUD TO 9.2 PPG AT SHOE. T.I.H. TO TOP OF FISH @2092, WASH FROM 2042 TO 2092. CIRC AND BALANCE MUD WEIGTH TO 9.5 PPG. SCREW INTO FISH @2092, AND START JARRING DOWN ONLY, NO MOVEMENT. STOP 38 BBLS PIPE LAX PILL AND DISPLACE WITH 240 STROKE. JAR FOR 15 MINUTES, LET JAR COOL DOWN, WHILE R/U/ WEATHERFORD TRUCK. R.I.H W/ BACK OFF TOOL AND BACK OFF AT 2092 (SCREW IN SUB). POOH W/ FISHING ASSEMBLY FOUND 1 JT 4.5 HWDP ATTACHED TO SCREW IN SUB. MAKE UP 8 1/8 WASHOVER ASSEMBLY BHA AND T.I.H TO 1470 (SHOE) TOOK AS WE ENTER THE OPEN HOLE.
- 11/01/07 Day 69. 15,500' TD. PO: POOH. T.I.H. W/ WASH PIPE ASSEMBLY TO SHOE START TAKING WEIGHT AT 1470. WASH AND REAM FROM 1470 TO TOP 2123, AVG WOB 0-4, SPM 66, PP 433, SLIGHT INCREASE PUMP PRESSURE WHEN STARTING OVER FISH, WASH FISH F/ 2123 TO 2281. POOH, W/ WITH PIPE , CHECK FOR SHOE FOR WEAR 5-8 %. T.I.H W/ (BHA12) CIRC 200 STROKE PRIOR TO SCREWING INTO FISH, RI.H. W/ BACK OFF TOOL, TOOL SET DOWN AT 2050, WORK UP AND DOWN COULD NOT PASS, PULL OUT W/BACK OFF TOOL, P/U WIRELINE JARRING ASSEMBL AND RUN BACK IN HOLE AND BEAT DOWN OBSTRUCTION TO 2753, POOH W/ WIRELINE JARRING ASSEMBLY, R.I.H W/ BACK OFF TOOL (560g), WHILE PLACING LEFT HAND TORQUE PIPE BROKE, RETORQUE STRING, RESET WEIGHT DOWN, 2ND ATTEMPT TO BACKOFF @ 2246 APPLIED LEFT HAND TORQUE SHOT, AND P/U STRING WEIGTH 53K, RETORQUE STRING, SET DOWN 83K AND APPLIED LEFT TORQUE AND SHOT OFF @2246, P/U STRING WEIGHT 83K. POOH, FIRST JTS VERY LOOSE, CHECK EACH CONECTION OUT FOUND THAT WE LEFT THE SCREW IN SUB ATTACHED TO FISH @ 2123.
- 11/02/07 DAY 70. 15,500' TD. PO: PIPE LAX PILL. FINISH OUT HOLE W/ FISHING TOOL, MISSING SCREW IN SUB (LEFT ATTACHED TO TOP OF FISH @2123. P/U 6 JTS 8 1/8 WASHPIPE, AND RACK BACK IN DERRICK, MAKE UP SHOE AND T.I.H. TO SHOE. WASH OVER FISH F/2123 TO 2480, WOB 0-4, SPM 66, PP 250. CIRC FOR 30 MINUTE, STAND UNION BEGAN LEAK, SHUT DOWN TO PULL OUT HOLE. POOH W/ WASHPIPE ASSEMBLY. T.I.H. W/ SCREW IN ASSEMBLY, CHECK BREAKS, TAG TOP FISH AND CIRC 1250 STROKES. SCREW INTO FISH @ 2123, CIRC WHILE JARRING DOWN ONLY. ATTEMPT TO BACK OFF, PIPE BACKED OFF MANUALY ARROUN 650 FEET , TORQUE PIPE AND ATTEMPT 2 BACKOFF, BROKE HIGH (DC ABOVE JARS, SCREWED BACK IN AND RUN IN HOLE WITH FREEPOINT

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TOOL FOUND NO MOVEMENT IN STRING F/2757 TO TOP FISH @ 2123'. JARRING ON FISH WHILE MIXING 70 BBL PIPE LAX PILL.

- 11/03/07 DAY 71. 15,500' TD. PO: TIH. CIRC AND JARRING ON FISH AFTER SPOTTING 30 BBL PIPE LAX PILL, DISPLACED W/ 230 STROKES SPM 80, PP 730 PSI MW 9.9 PPG VIS 48. CONTINUE JARRING ON FISH , FISH CAME LOOSE PICK UP 150K OVER JARRING WEIGHT, (JAR DOWN ONLY). POOH , RECOVERY OF TOTAL FISH, 18 DC, 1 HWDP , 1 BS, 1 BIT. BRAKE OUT FISHING TOOL AND LAY DOWN, RACK BACK BHA (FISH). RIG SERVICE AND CLEAN FLOOR. SLIP AND CUT DRILL LINE. TIH W/ BHA 14 WHILE, INSPECTION OF 18 6.5DC, (FOUND 1 CRACKED), INSPECT 11- 4.5 HWDP 1- 6.125 DRILLING JAR.
- 11/04/07 DAY 72. 15,500' TD. PO: W&R. TIH W/ BHA 14 WIPER TRIP, WHILE INSPECTING BHA. TIME CHANGE. WASH AND REAM F/ 1605 TO 3331. CIRC AND PUMP SWEEP. WASH AND REAM F/ 3331 TO 5002 RPM 60 WOB 4-16, PSI 1200 SPM 100, MW 11.5/ 11.4 PPG VIS 46/47. CIRC AND CONDITION MW 11.5PPG VIS 46, TROUBLE RAISING WEIGHT, START USING BAR. WASH AND REAM F/5002 TO 5204 RPM 100, PP 1200, WOB 10-12, 4-5 FLARE BRIGHT ORANGE INTERMITTEN PRESENT BIT DEPTH 5204.
- 11/05/07 DAY 73. 15,500' TD. PO: PUMP SWEEPS. WASH AND REAM TO BOTTOM F/ 5222 TO 7222, WOB 2-10, RPM 60, PP1200. WASH AND REAM F/ 7222 TO 8904, PUMP SWEEP. CIRC AND CONDITION MUD. WASH AND REAM F/ 8904 TO 10067, WOB 2-12, RPM 60, PP 2950, PUMP SWEEP TO CLEAN HOLE, MW 12.6 VIS 54. RIG SERVICE TOP DRIVE. WASH AND REAM F/ 10067 TO 14929, WOB 10, RPM 60, PP 2950. PUMP SWEEPS MNW 12.7/12.8 VIS 47/58.
- 11/06/07 DAY 74. 15,500' TD. PO: TIH. WASH AND REAM F/ 11407 TO 14929, WOB 10, RPM 60, PP 2900, MW 12.7/12.8 PPG VIS 47/58 PUMP SWEEP. RIG REPAIRS PUMP # 1 AND #2. WASH AND REAM TO BOTTOM F/14929 TO 15500. CIRC AND CONDITION MUD 12.8 PPG IN OUT 12.8 PPG VIS 57. POOH (WIPER TRIP ) N O TIGHT SPOTS (SMOOTH), REMOVE 2 STRING STABILIZERS AND CHECK BIT. RIG SERVICE. T.I.H. TAG BRIDGE AT 2749. MAKE UP TOP DRIVE AND WASH AND REAM F/ 2749 TO 2844, CONTINUE T.I.H.
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- 11/08/07 Day 76. 15,500' TD. PO: WO loggers. Trip in the hole to 7000'. Circulate bottoms up. Trip in the hole to 15400'. Wash and Ream from 15400' to 15500'. Circulate and condition Mud and the hole, Raise viscosity from 54 to 75, Pump high viscosity sweep all the way around to clean the hole. Mix and pump Drill pipe slug ( 14.8 ppg. ). Trip out of the hole, 45k overpull from 15500' to 15320', 25-30k over pull from 15320' to 6500', 15-20k overpull from 6500' to 1470', 22k overpull at 2749'. Clear Floor and Wait on Baker-Atlas Wire Line loggers.
- 11/09/07 Day 77. 15,500' TD. PO: TIH. Rigging up Baker-Atlas Wire Line loggers. Line spool had back lash on the trip to the location, so they had to straighten that out then had to Re-head the line. Running Wire Line logs, Wire Line TD 15515', Run Digital Spectra-Log, Compensated Nuutron, Z-Densilog, Array Acoustilog (8 channel ) Cross Multipole Array Acoustic, Shear Wave Acousilog, Multi-Pole Array Acoustic, High Definition Induction Tool. Rig-down Baker-Atlas Wire line loggers. Make up Bit # RR2, Handle BHA, Trip in the hole to 1470', Break circulation. Trip in the hole to 2169'. Wash and Ream from 2169' to 2360' (wob 5-15k, rpm 45, spm 90, 900 psi). Trip in the hole to 4170'. Wash and Ream from 4170' to 4360' (wob 5-20k, rpm 60, spm 90, 1150 psi). Trip in the hole to 6262'.
- 11/10/07 Day 78. 15,500' TD. PO: LDDP. Circulate bottoms up at 6262'. Trip in the hole to 11014', Break circulation and circulate 20 minutes at 8636'. Circulate bottoms at 11014'. Trip in the hole to 13392'. Circulate and condition hole at 13392'. Trip in the hole to 15415'. Wash and Ream from 15415' to 15500' with no fill. Circulate and condition hole clean (Weight 12.8 ppg, Viscosity 75). Mix and pump weighted sweep all the way around (Weight 13.2 ppg, Viscosity 80). Mix and pump drill pipe slug (14.8 ppg). Pull 6 stands and stand back in the derrick. Lay-down 4 1/2 drill pipe (Tight at 2750' to 2320', 10-15k over normal overpull).
- 11/11/07 Day 79. 15,500' TD. PO: Troubleshoot. Lay-down BHA. Pull Wear Bushing. Rigging up Casing crew, Stabbing board and Fill-up tool. Hold Safety and Procedure meeting. Run 5.5" casing to 14,207'. Running order: Shoe-1 Joint- Float collar- 30 joints- Marker joint- 31 joints- Marker joint- 34 joints- Marker joint- 34 joints- Marker joint- 224 joints = 15495.08. Centralizers every 3rd joint = 70. Install Rotating head rubber insert. Troubleshoot problem with the Casing slips.
- 11/12/07 Day 80. 15,500' TD. PO: DRESS TOP OF CASING. CONT TO RIH W/ 5-1/2" 20# CSG W/SHOE @ 15516'. RECIPROCATATE CSG AND CIRCULATE CSG WHILE RD WEATHERFORD CSG CREW & EQUIP. CONT ATT TO RECIPROCATATE AND CIRCULATE CSG WHILE MI, SPOT, & RU HES CEMENTING CREW AND EQUIP. CSG STUCK

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W/SHOE @ 15495'. **CMT 5-1/2" 20# CSG IN PLACE @ 14495' WITH 2700 SXS (1899 LEAD & 900 TAIL) OF 13 PPG.** DROP PLUG & DISPLACE TO LOCK W 342 BBL 8.3 FW @ 4200 PSI, (1500 PSI OVER PI PRESS). CHECK FOR BACK FLOW, NONE. WASH OUT STACK AND WELLHEAD BOWL, SI WELL AND WOC. ND BOPE. PULL 30K OVER AND SET CSG IN SLIPS. CUT AND DRESS TOP OF 5-1/2" CSG. INSTALL WOOD GROUP TREE AND NU SAME. RD FLOOR AND CLEAN UP.

11/13/07 WO completion rig.

**COMPLETION REPORTS –**

12/31/07 Completion day 1. Well Shut in. Opened well to flow back tank at 1530 and flowed back to tank. SI pressure was 2200 psi. Opened well on 10 choke. Well flowed back gas with small amounts of fluids. Unable to get measurement on fluid due to frozen tank bottoms. Very little fluid during this flow back period.

01/01/08 Completion day 2. No report.

01/02/08 Completion day 3. Well flowing gas to flow back tank on 10 choke. Traces of water but not enough to measure. Crews arrived and we put well to pit on 10 choke. Ignited gas and had strong blow with a 10' to 12' flare. Flare is steady with slight heads of water. Again water is not strong enough to put out flare. Pressure has slightly increased to 1050 to 1100 psi. Moved in and RU BWWL. RIH with GR and logged from 15378' to 8000'. Indications are that we have fill up above where we need to set Frac Plug. Will need to RIH with Bit & Scraper and clean out to below 15,400'. Having a very difficult time trying to correlate logs. RD BWWL. Continued to flare well on 10 choke. Pressure has increased to 1100 psi. Have a good 10' to 12' flare with small amounts of water.

01/03/08 Completion day 4. Continued to Flare well to pit. Pressure holding at 1100 psi. Flaring well on 10 choke. No fluid recovery. Finished rigging down BWWL and releasing them. Thawed out BOP's and Nipped up same. Preparing to kill well in the AM with 2% KCL and RIH to clean out to TD. Continue to Flare well to pit on 10 choke. Pressure remains to be a steady 1100 psi. Well is not making any fluid. Flaring with a 10' to 12' flare. No signs of oil or condensate.

01/04/08 Completion day 5. Change out gauges on manifold.



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- 01/05/08 Completion day 6. Continued to flair well to pit. Flowing on a 13 choke with pressures at 1050. Maniflod and all lines freezing up. Hooked up large diesel heater and tarped maniflod. At 1100 hours shut well in due to high winds. Unable to keep gas burning. Moved in and rigged up Coil tubing services. At 1700 hours finished RU Coil Services and opened well to pit. Pressure at 145 psi, on 12 choke. Flaired well with good 12' to 14' flair.
- 01/06/08 Completion day 7. Flaired well to pit on 12 choke, pressure at 1200 psi. No fluid recovery during this period. Finish rigging up coil unit. Hooked up to water tank, tank holding 500 bbls of 145 degree 2% KCL water. Held Safety Meeting, Make up 4 1/2" drag bit, XO, 2 7/8" PDC Motor and start in hole with 1-3/4" coil tubing. Tagged fill at 15,415'. Circulating with 2% KCL and 500 SCF of N2. Washed down to 15,442'. Sand was firm to hard taking 4 to 5K to wash. Pumping at a rate of 2.25 BPM. Flowing back N2 and water. Pressure at 300 to 500 psi. Flowing back to flow back tank. Pumped a total of 525 bbls of water. Indications are we are on the Float Shoe at 15,442'. Circulate hole clean, pressure at 300 psi, well unloading water. POH with coil tubing. Dried out coil tubing with N2, rigged down and released coil unit. Pumped a total of 525 bbls of fluid. Recovered a total of 256 bbls at 2200. 269 bbls left to recover. Flowing well to pit. Heavy snowfall for the past 2 days. Snowed over 2' in past 36 hours and still snowing. Equipment having trouble on the roads from here to Rosevelt and Vernal. Having to assist some of our equipment in and out of the location. Flowing well back to flow back tank on 15 choke 400 psi, recovered a total of 229 bbls of water. Correction on water used to circulate with. Pumped a total of 500 bbls. Have now recovered a total of 270 bbls. Left to recover is 229 bbls.
- 01/07/08 Completion day 8. Thawed out Frac Valve while rigging up BWWL to run GR log to determine where perforations are and see where Frac went. RIH with log and tagged bottom at 15434'. Log from 14,000' to TD. POH and RD WL. Thaw out flow lines and open well on 21 choke. Pressure at 1300 psi. Continue to flow and flair well to pit. Choke size ranging from 21 to 15 in attempt to unload water. No fluid recovery during this period. Pressure at 2400 hours is 1300 psi.
- 01/08/08 Completion day 9. Continued to flair well to pit. Pressures ranging from 1300 psi down to 1150 psi. Adjusting choke size as needed to keep well from freezing up. Temperature at -8 degrees at midnight, with a light snow. Choke size decreased from 18 down to 14. No fluid recovery during this period.

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- 01/09/08 Completion day 10. Continued to flair well while waiting on flange to rig up Slick Line Truck to run tracer log. Protechnics was informed of what they would need to rig up. RU and RIH to trace 1st Frac. Traced Iridium and results looked the same as on GR log. Log will be sent to Greg in Denver office tonight. RD Slick line and RU BWWL. Made up composite BP and perforating gun and ran in hole. Set plug at 15,350'. **Perforated bottom zone at 15,325 to 15,330'**. Perforated with 4" casing gun 23.5 gm and .43 dia. Shot 2 SPF. POH, LD gun, all shots fired. Picked up loaded guns and ran in hole. **Perforated from 15,250 to 15,255', 15,050 to 15,058, and 14,994 to 14,998'**. All shots were 2 SPF. Pulled out of hole and all shots fired. Used extreme caution while correlating before setting plug and perforating. RD BWWL. Left logging truck and equipment on site to be ready for next zone on Friday PM. Well shut in for Frac on Friday, 01/11/08.
- 01/10/08 Completion day 11. Well shut in while preparing to Frac.
- 01/11/08 Completion day 12. Well shut in for Frac. Opened well and attempted to bleed down pressure. Pressure at 1850 psi, flaired well to pit while waiting on Halliburton. Ppressure holding at 1800 on 12 to 14 choke. Left well open until noon. Pressure at 1650 and still blowing hard on 14 choke. Moved in Halliburton Frac equipment to **Frac zone 3**. Waiting on Halliburton generator to run Tech Command Center. Finished RU Halliburton. Held safety Meeting, tested all lines to 9800 psi. Loaded hole with 221 bbls of fresh water and 1000 gallons of 15% Acid. Pressured up to 10000 psi and could not break down formation. Let pressure bleed down to 7500 psi and brought pressure back up to 10 K rapidly but formation would not break down. Discussed problem with Halliburton and P/C Drilling Manager who is on location and it was decided to get 15 K iron brought to location. Opened well to pit at 1500 hours to flow back frac water. Pressure at 6800 psi. Pressure bled down to 0 recovering 110 bbls of fluid with 111 bbls left to recover.
- 01/12/08 Completion day 13. No report.
- 01/13/08 Completion day 14. Well open venting gas with 1000 psi on 14 choke. No fluid recovered during this period. Shut well in at 0700 to rig up Stinger. Move in and rig up Stinger. Rigging up Halliburton 15 K lines. Waiting on a 15 K floor valve from Vernal. Held safety meeting. Tested all lines to 12700 psi. Loaded hole with clean fresh filtered water and 1000 gallons of 15% Acid. Pump in pressures very high. Max psi 12004, Average pressure 9570 psi, Max. puming rate 38.5 bbp, average pumping rate 29.1 bbm. Pressure rise once 0.5 #/gal sand hit formation. Pumped approx. 37% of designated sand amount. 33.5% in formation, 134 sacks of 30/60 bauxite in formation and 17.5 sacks left in casing (150'). Traced

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all sand with Protechnics. Traced with SB-124 ZW (Antimony). ISIP 10370 psi, 5 Min. 8535, 10 min. 8537 psi, 15 min. 8541 psi. This was a Mancos Frac in Zone 3. Total fluid pumped 1884 bbls. RD Halliburton, RD Stinger. Covered well head with tarps and hooked up 2 heaters to keep well head from freezing. Opened well on 24 choke. Pressure bleed from 7000 psi to 0 in 45 minutes.

01/14/08 Completion day 15. Well open on 24 choke, 0 pressure with a medium blow. Flowed back a total of 160 bbls of frac water. Rigging up Halliburton. Supervisor advised that he would be unable to Frac today due to mechanical problems with 2 of his pumpers. Rig them down and took same to town for repairs. RU BWWL and ran in hole with 4.0 Gauge Ring and Junk Basker. Ran in slowly while checking for frac sand that was supposedly in casing. Ran in to 14,970' and did not tag sand. POH with W.L. Made up Halliburton Flow Through Plug and perforating gun and ran in hole. Set Flow Through plug at 14,960'. Pulled up and perforated at 14,913' to 14,918'. Perforated 2 SPF with 4" casing gun. Pulled out of hole. All shots fired. LD setting tool and made up Second gun. RIH and **perforated 14,788' to 14,803' and from 14,720 to 14,725'**. All with 2 SPF. POH all shots fired. RD BWWL. Open well on 18 choke, pressure at 2200 psi, bled down to pit. Recovered 44 bbls of frac fluid.

01/15/08 Completion day 16. Well open on 18 choke, 0 pressure with medium blow. Recovered 46 bbls of frac fluid. Move in and rig up Stinger. Sting in wellhead. Move in and rig up Halliburton to Frac Zone 4. Halliburton had problems with lines, hoppers, and hoses being frozen. Began testing lines. It took 2 hours to repair leaks in Halliburton Equipment. Held safety meeting and finished testing lines to 12,200 psi. **Frac Zone 4** with 3440 bbls of fresh clean city water. Pumped a total of 56,500# of 30/50 ceramic bauxite. Broke formation down at 10800 psi. Max. psi 11006, average psi 9344 with maximum rate for short period was 35.34 bpm, average rate was 29.49 bpm. Lost 1 pump at the beginning of the job and made repairs on 2 others on the fly. Halliburton equipment struggling with the high pressures. Traced all sand with IRIDUM (IR-192 ZW). Final ISIP 8027 psi, Final Frac Gradient 0.98, ISIP 5 min. 7870, 10 min. 7796, 15 min. 7747. RD Halliburton, Sending pumps to town for repairs. RD Stinger. Sent Stinger to town. Note: design rate of 40 BPM could not be achieved due to malfunctioning pump trucks. LA pump on blender was lost during 0.75#/gal sand stage, FR was manually trickled into blender tub. 2 other pumpers were worked on during job. Run in hole with BWWL. Run in with Flow through plug and perforating gun. Pressure at 7600 psi when starting in hole. Pressure began to increase and at 8500' pressure was at 10K plus. Started pulling out of hole slowly. Pulled up Lubricator. Tools would not go in Lubricator due to a ice plug. Tools in

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master value. Waiting on hot oiler. Continue to wait on Hot Oiler to thaw out Lubricator.

- 01/16/08 Completion day 17. Waiting on Hot Oiler, called 7 different companies trying to get 1 to location and they are all busy due to the very frigid weather. High pressure pump arrived at 1500 hours. Pumped in 150 gallons of methanol. Appears now that along with ice plug the rams are partially closed not allowing the tools to get all the way into the Lubricator. BWVL sending out specialist from Wyoming to bleed down pressure that is trapped behind rams. Hot Oiler arrived and heated Lubricator, still could not get tools up in Lubricator. Tools hanging in aster value. Flowing well to keep pressure down. Pressure at 2000 psi at 2400 hours.
- 01/17/08 Completion day 18. Trying to free up tools. Warmed up Lubricator and well head all night with hot oiler. No ice in either. Continued to flow well to pit. Pressure at 2400 hours 5000 psi. Flowing on 14 choke. Thawed out rig pump and lines and pumped 80 bbls of 2% KCL down hole. Pump pressure 1000 psi at 4 BPM. Did not pressure up at tools at 112'. Changing out hydraulic hoses on 10K trailer. Opened up relief valve on top of Lubricator and pressure dropped to 0 indicating rams are CLOSED. This is why line will not go up or down. Rigged up a high pressure manual pump and hooked to 10 K BOP. Pressured up to 4000 psi and one side of preventers opened. Pulled tools up from 112' to 7', 8'. Hooked up to other side and trying to open. Continued to get ram to open with no success. 10 K specialists now saying a bolt is broken behind the ram not allowing it to fully open. Began trying to bleed down well in order to get tools out of the hole. Started on 24 choke and ended with full opening. Well continues to flow gas and pressure will not bleed to 0.
- 01/18/08 Completion day 19. Completion day 18. Continued to blow down well while trying to get 10 K rams open 1 ram seems to be 1/2 open. Unable to get wire line tools through Lubricator. In hole is a Flow Through Frac plug, setting tool and a 5' perforating gun. Pressure is at 0 but well still making gas. Estimate is approx. 200 to 300 mcf. Top of tool is at 7.6' in Lubricator. Opened bleed of value at top of Lubricator, bleed down gas. Gas in Lubricator is partially frozen, backed off Lubricator below rams. Pulled up in to top of derrick with Lubricator clearing the tools above the frac value. Closed Frac value immediately and secured well. Laid down tools and Lubricator. As suspected 1 ram was partially open which would not allow tools to enter into the Lubricator. RD BWVL and 10 K Lubricator. Sent both to town. Well shut in while rigging down WL. Continued to fill Frac Tanks for next Frac on Tuesday. Filling a total of 23 500 bbls tanks. Continued to flow back well. Opened with 1150 psi, on 14 choke. At 2400 hours pressure at 300 psi on 14 choke.

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- 01/19/08 Completion day 20. Flowing back well to pit. Pressure at 300 psi on 14 choke. Very little water recovered during this period. Changed to a 12 choke. Flaring to pit. Had about a 2 bbl kick of water. Caught a sample and tested resistivity @ 450. Pressure @ 400 psi on 12 choke. Flowing back well to pit. Pressure at 400 psi on 12 choke. Water TTR is 5515 bbls and recovered 764 bbls with 4751 bbls LTR.
- 01/20/08 Completion day 21. Flaring to pit. Pressure 400 psi on 12 choke. No measurable water.
- 01/21/08 Completion day 22. Flaring to pit. Pressure 400 psi on a 12 choke. No water. Flaring to pit. Pressure 350 psi on 12 choke. Light trace of water at 17:00. Sample caught and tested at 600 grains of sodium, temp. 70, holms .6. Flaring to pit. Pressure varied from 350 to 400 psi on 12 choke. Traces of water at 350 but no measureable amount.
- 01/22/08 Completion day 23. Flaring to pit. Pressure varies from 350 - 400 psi. Light trace of water at 350.
- 01/23/08 Completion day 24. Flaring well to pit, pressure at 1600 psi on 12 choke, no fluid to surface. Halliburton arrived on location at 1500 hours and spotted Frac equipment on location. Rigged up 10 K lines to well head. Stinger arrived at location at 1400 hours. Spotted tools next to well head and will run in with stinger in the morning. Frac scheduled to begin at 0700. Flaring well to pit on 12 choke.
- 01/24/08 Completion day 25. Continued to flare well on 12 choke. Pressure at 1200 psi at 0600 hours. Move in and RU Stinger and Halliburton. Tested Halliburton lines and values to 12,500 psi. Opened well and loaded hole with 1000 gallons of 15% acid. Formation broke down at 12,095 psi at 40 BPM. Pumped a total of 2445 bbls of fluid. Average pumping rate 39.2 BBP, Max. rate 41.1 bpm, Max. pressure 12,095 psi, average pressure 9,409 psi. Pumped 28,700 lbs of 30/50 ceramic prop. Max. at 1.50 ppg. Traced sand with Sc-46 (scandium). ISIP 7900 psi, 5 min. 7724 psi, 10 min. 7683 psi, 15 min. 7655 psi. RD Stinger. RU BWL. Rigged up 10 K lubricator. Made up Flow Through Frac Plug and perforating gun. Attempted to run in hole but tools would not fall due to high well pressures. Picked up weight bar and bleed down pressure on well to 5100 psi. Was able to run in hole at a slow pace. Set Plug at 14,400'. **Perforated at 14,382' to 14,387' & from 14,315' to 14,320'.** All with 2 SPF. Pulled out and laid down setting tool and guns. Made 2nd run with guns and **perforated from 14,203' to 14,208' & from 14,156' to 14,161' & 14,108' to 14,113'.** All shots at 2 SPF, all shots fired. POH, RD BWL. RU Halliburton and tested lines and values to 12,500 psi. Opened well and pumped 1000 gal of 15% Acid. Broke down formation

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at 9530 psi with 8.6 bpm. Max.psi 10,595, avg. psi 9,425, max. rate 40.3 bp-m, avg rate 30.1. Pumped a total of 1787 bbls of clean city water. Pumped a total of 15,130 lb of 30/50 ceramic prop in formation. Frac Gradient 0.96. ISIP 7,42, 5 min. 7375 psi, 10 min. 7353 psi, 15 min. 7337 psi. Lost sand cap on 2 trucks during pad, shut down to repair. Unable to get designed rate, truck lost packing. Called flush after .5 #/gal, another truck was getting ready to drop out. Flushed with 1000 gal overflush. Traced sand with Sb124 (antimony). RD Halliburton. Open well on 10 choke to pit. Have pumped in a total load of 9647 bbls. Have recovered a total of 707 bbls. 8940 bbls left to recover.

- 01/25/08 Completion day 26. No report.
- 01/26/08 Completion day 27. Flow back well on 10 & 12 choke. Pressures from 1000 psi to 950 psi. Recovered a total of 740 bbls in 24 hours. Left to recover 5952 bbls.
- 01/27/08 Completion day 28. Flowing back well to pit. Pressure at 900 psi on 8 choke. Recovered 460 bbls of fluid in 24 hours. Left to recover 5492 bbls.
- 01/28/08 Completion day 29. Flow well to pit on 8 choke, pressure at 900 psi. RU BWL, RIH with Flow Through Plug and perforating guns. Set Plug at 14000'. Perforated from **13,898' to 13,906'**. Shot 2 SPF, all shots fired. Ran 2nd gun and perforated from **13,792' to 13,800', and from 13,730' to 13,738'**. All shots 2 SPF, POH, all shots fired. RD BWL. Well shut in while hot oiler heating tanks. Strong winds blowing gas and water directly over hot oil unit. Heavy snow fall and high winds has roads closed in and out of location. SICP at 2400 hours 3800 psi.
- 01/29/08 Completion day 30. Flow back well. Halliburton moved in 3 pump trucks. Halliburton moved in equipment. Scheduled to begin Frac at 0600 hours. Continued to flow and flare well to pit. Pressures dropped from a SI of 4600 psi to 400 psi, flowing on chokes of 12 down to a 6. Recovered a total of 150 bbls of fluid in 24 hours. Total LTR 5342 bbls.
- 01/30/08 Completion day 31. Flow & flare well to pit. Stinger arrived and installed stinger at 0600. Wait on Halliburton crew to arrive. They were supposed to be on location and ready to pump at 0600. Crew got lost, not familiar with area as they are from Bakersfield, CA. Finish RU Halliburton, held Safety Meeting. Tested all lines to 12,500 psi. Thawed several ice plugs from lines and manifold. Pumped 1000 gallons of 15 % Acid. Formation broke at 9862 psi at 26.5 BPM. Pumped in a total of 4000# of sand. Only got in .25# before well screened out. Sand is 30/50 ceramic. Max. psi 12,350, Average pressure 9,879. Average rate 26 bpm, max. rate 42

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bpm. Frac Gradient 1.09 psi/ft. Pumped a total of 1278 bbls of fluid. ISIP 8944, 5 min. 7677 psi, 10 min. 7642 psi, 15 min. 7612. Traced sand with IR-192 (Iridium). RD Stinger and moved away from well head. RD Halliburton from well head. RU BWWL. Make up 10 K lubricator and RIH with Flow Through Plug and 2 - 5' perforating guns. Set plug at 13,620'. Picked up 30', ran back and tagged plug. Plug in place. Perforated **13,510 to 13,13,515., & 13,462 to 13,467**. Shot at 2 SPF. Pulled out of hole. Made up guns and Ran hole. Perforated from **13,335 to 13,340. & 13,305 to 13,310, & 13,082 to 13,087'**. All perforations shot at 2 SPF. POH, laid down guns, all shots fired. RD BWWL, leaving lubricator hanging in derrick. Pumped in a total of 1278 bbls during this stage. Total left to recover now is 6620 BBLS. Opened well on 10 choke. Tarping well head and firing up heaters to keep from freezing. NOTE ON FRAC: Due to problem with the liquid additives pump on the blender, the job was shut down for a few minutes during pad stage to fix it before completing the pad volume. Job proppant volume shown on ifs was inaccurate due to densometer not reading the proppant concentration right. Called flush early after the well screened out at the beginning of the 0.5 sand stage. Opened well on 12 choke at 2200 hours. Starting pressure 4000 psi, bled down to 900 psi at 0600 hours. Recovered a total od 360 bbls of water during this flow back. Correction, recovered a total of 420 bbls during this period. Left To Recover 6200 BBLS.

01/31/08 Completion day 32. Flowing well to pit on 12 choke. Pressure at 900 psi. Move in and rig up stinger. Sting into well head. RU Halliburton to well head, Held Safety Meeting. Pressujre tested all lines and manifold to 12,500 PSI. Pumped 95 bbls of water to fill casing. Formation broke at 10,348 at 15 bpm. Pumped 1000 gals of 15% Acid. Pumped a total of 2803 bblos of water, pumped in 32,096 # of 30/50 ceramic. Job was designed for a total of 50,000 # of sand. Pumped in all of .25, .50, and .75 # sand. Went to flush due to problems with blender and IFS. Max. rate at 42 bpm, average rate 39 bpm. Max. pumping pressure 10,867. Average pressure 9,000. ISIP 7,520, 5 min. 7275, 10 min. 7223, 15 min. 7173. Traced all sand with Scandium (SC-46-ZW). Good job considering temperatures of -10 degrees. Partially rigging down and moving aside Halliburton so we can get hot oilers in to heat water. Now have 13 tanks full of water with freezing problems. Will run plug and perforate tomorrow. Flowing well to pit on 8 choke. At 2400 hours pressure at 2800, water recovered for this period 840 bbls.

02/01/08 Completion day 33. Flowing well back to pit on 8 choke, pressure at 1800 psi. RU BWWL. RU 10 K lubricator, make up 10 K Flow Through Plug and perforating guns and RIH. Set Plug at 12, 985'. Perforated 2 SPF from **12,939' to 12,943' & 12,860' to 12,864**. Pulled out of hole. LD setting tools, and guns. All shots fired. PU guns and RIH. Perforate

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**12,808' to 12,820' & from 12,667' to 12,672'.** Again all 2 SPF. POH, all shots fired. RD BWWL. Halliburton on location servicing equipment for Frac tomorrow. Filling Frac Tanks and heating same. Fluid Left To Recover: 8163 bbls. Well open on 14 choke, pressure at 1500 psi at 2400 hours. Recovered a total of 1120 bbls of fluid with 7043 bbls Left To Recover.

02/02/08 Completion day 34. Flowed well on 14 choke overnight. Pressure at 1000 psi. Hauled in clean city water for Frac. Two hot oilers on location heating water. Finished heating water with hot oiler. RD Hot Oilers and move out same. Moved in Stinger and stung into well head. Rig up Halliburton lines to well head. Held Safety Meeting. Pressure tested all lines, valves and manifold to 12,500 psi. Open well and loaded hole with 162 bbls of clean fresh city water. Formation broke at 8408 psi at 20 BPM. Pumped 1000 gallons of 15% Acid. Pumped a total of 3960 bbls of fluid. Pumped in a total of 60,010 # of sand. Pumped .25, .50, .75, .100, and 1.50. Max. treating pressure 9768, average treating pressure 7650. Max. rate 45 BPM, average rate 40 BPM. ISIP 6758 psi, 5 min. 6918 psi, 10 min. 6897 psi, 15 min. 6882 psi. All sand traced with Antimony, (Sb-124 ZW). Text Book Job, put away all sand at a good rate with decent pressures. RD Halliburton lines from well head, Removed stinger. RU BWWL, RU 10 K lubricator. RIH with 10 K Flow Through Plug, and perforating gun. Set Plug at 12465. Picked up 30', set back down on plug, plug in place. **Perforated from 12,375' to 12,380'.** Perforated with 2 SPF. Pulled out of hole, LD setting tool and gun. All shots fired. Made up 3 -6' guns and RIH. **Perforated 12,330' to 12,336', & 12,232' to 12,238', & 12,120' to 12,126'.** All shots at 2 SPF. POH, LD guns, all shots fired. Opened well on 12 choke at 2100 hours. Flowed well back to pit, pressure at 2400 hours 2800 psi. Recovered a total of 880 bbls of water. Now have a total load of fluid to recover: 10,123 bbls.

02/03/08 Completion day 35. Flow back well to pit, pressure at 2700 psi at 0600. Move in Stinger and RU on well head. RU Halliburton on well head. Held Safety Meeting with all personnel. Test all lines, manifold and valves to 12,500 psi. Pumped in 60 bbls of clean city water to fill casing. Pumped in 1000 gallons of 15% Acid. Formation broke down at 9859 psi at 15 BPM. Pumped in a total of 3810 bbls of fluid. Max. pressure at 10,215 psi., average pressure at 7,600 psi. Pumped in a total of 59,383 pounds of 30/50 PRC sand. Max. rate at 43 BPM, average rate 38 BPM. Frac Gradient 0.96. ISIP 6449 psi, 5 min. 6150 psi, 10 min. 6105 psi, 15 min. 6128 psi. Traced all sand with Scandium Sc-46 ZW. RD Stinger, RU BWWL, RU 10 K lubricator. RIH with Flow Through Plug and perforating gun. Set plug at 12000'. Picked up 30', ran in and tagged plug, plug in place. **Perforated from 11,967 to 11,972'.** Shot with 2 SPF. POH, LD setting tool and gun. All shots fired. Made up 3-5' guns and start in hole.



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Problems with collar locator, pulled out and laid down lubricator. Continued to have problems with BWWL. Cut 500' of cable from spool. RE-headed lubricator. Fluid Left To Recover: 13,553 bbls.

- 02/04/08 Completion day 36. Had problems with BWWL electric line, cut off 500' of bad wire. Re headed lubricator and picked up 3-5' guns. Re-ran same guns that did not fire on last run due to bad wire. RIH **perforated from 11,847' to 11,852' & from 11,781' to 11,786' & from 11,710' to 11,715'**. All shots 2 SPF. POH, all shots fired. RD BWWL. Flow back well to pit on 12 choke. Pressure at 3900 psi with 13,553 bbls left to recover. Move in Stinger and sting into well head. Began rigging up Halliburton. Held safety Meeting. Tested all lines, values, manifold to 12,500psi. Opened well and loaded casing with 63 bbls of clean fresh city water. Formation broke at 8603' psi at 16 BPM. Pumped 2673 bbls of fluid. Max. pressure 9500 psi, average pressure 6700 psi. Max. rate 37 BPM, Average rate 35 BPM. Pumped a total of 23,539 pounds of 30/50 PRC. Frac gradient 0.95. ISIP 6063, 5 min. 5740 psi, 10 min. 5725 psi, 15 min. 5714 psi. Pumped in 1000 gallons of 15% acid before sand. During the 0.75 ppg sand stage the blender shut down due to being OUT OF FUEL. Job was then shut down for a period of time while the pre-gel blender was set to pump. Due to the length of time we were down 290 bbls of flush was pumped without any chemicals. This Frac was scheduled to pump in a total of 60,000 pounds of sand. Very poor performance from Halliburton. Rig down Halliburton and move off location. They were committed to another Company for tomorrow. Flowing back well to pit on 14 choke. Pressure at 2400 hours 1600 psi. Flowed 1228 bbls during this period. Left to Recover: 16,226 bbls of fluid.
- 02/05/08 Completion day 37. Flow back well to pit. Pressure at 1200 psi on 14 choke. RU 10 K lubricator, Make up 10 K Flow Through Plug and 5' gun and RIH. Set plug at 11,650. Attempt to perforate, miss- fire. POH, LD setting tool and gun. Found short in line. Made up guns and RIH. Perforated **11,587' to 11,592' & 11,499' to 11,506' & 11,480' to 11,486', & 11,466' to 11,472'**. All shots are 2 SPF. POH, LD guns. All shots fired. RD BWWL. Open well to pit and flow back on 14/ 16 choke. Pressure at 2400 hours 2000 psi. Flowed back a total of 1480 bbls of fluid during this period. LTR: 14,746 bbls.
- 02/06/08 Completion day 38. Continued to flow back to pit. Pressure at 2800 psi on 16 choke. Recovered a total of 1920 bbls of fluid. Fluid mostly water with traces of gas. Gas will burn until hit with a large slug of water. LTR: 12826 bbls.

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02/07/08	Completion day 39. Flow back to pit on 16 choke. Pressure at 2400 hours = 2300 psi. Recovered a total of 1460 bbls during this period. LTR: 11,366 bbls.
02/08/08	Completion day 40. Flow back to pit on 16 choke. Pressure at 2400 hours = 2200 psi. Recovered a total of 1220 bbls during this period. LTR: 10,146 bbls.
02/09/08	Completion day 41. Flow back to pit on 14 choke. Pressure at 2400 hours = 1600 psi. Recovered a total of 1180 bbls during this period. LTR: 8966 bbls.
02/10/08	Completion day 42. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 960 bbls during this period. LTR: 6956 bbls.
02/11/08	Completion day 43. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 580 bbls during this period. LTR: 6366 bbls.
02/12/08	Completion day 44. No report.
02/13/08	Completion day 45. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 460 bbls during this period. LTR: 5906 bbls.
02/14/08	Completion day 46. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 460 bbls during this period. LTR: 5446 bbls.
02/15/08	Completion day 47. Continue to flow back well. Pressure at 2400 hours 2400 psi. Flowed back a total of 320 bbls. LTR: 5126 bbls.
02/16/08	Completion day 48. Flowing well to pit. Pressure at 2400 hours 3200 psi. Flowed back a total of 20 bbls. LTR: 5106.
02/17/08	Completion day 49. Continue to flow back and flare well. Pressure at 2400 hours on 18/64 choke: 1400 psi. Flowed back 620 bbls of fluid. LTR at 0600 hours : 4486 bbls.
02/18/08	Completion day 50. Continue to flow and flare well to pit. Pressure at 2400 hours 2400 psi on 14/64 choke. Recovered a total of 250 bbls during this period. LTR: 4236 bbls.

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- 02/19/08 Completion day 51. Continued to flow and flare well to pit on 14 choke. Moved in and rigged up Halliburton to **Frac Zone 12**. Rigged up on top of Frac Value. Problems with Equipment being froze. Manifold had to be thawed out, full of ice plugs. Tested all lines and manifold to 9550 psi. Repaired several leaks on pump trucks. Finally got a good test. Held safety meeting prior to pumping job. Pressured up on top of Frac value to 2800 psi. Opened value and loaded hole with 102 bbls of clean city water. Break down at 7560 psi. Pumped 1000 gallons of 15% Acid. Pumped a total of 3363 bbls of fluid. **Pumped a total of 50,000# of 30/50 PRC sand.** Pumped 0.25#, 0.50#, 0.75#, 1.0# and 1.50#. Max. pumping pressure 8511 psi, average pumping pressure 6444 psi. Max. rate 44.8 bpm, average rate 41.1 bpm. Final ISIP 5350 psi, 5 min. 5240 psi, 10 min. 5160 psi, 15 min. 5104 psi. Frac Gradient 0.90 psi. Traced all sand with Antimony. Good job. RD Halliburton. RU BWL and RIH with Flow through plug and 1- 8' gun. Set plug at 11410'. Picked up 30', set back down and plug in place. **Perforated from 11,228' to 11,236'.** Perforated 2 SPF. Pulled out of hole, all shots fired. RIH with guns and perforated from **11,172' to 11,180', and from 11,074' to 11,082'.** All at 2 SPF. POH, LD guns, all shots fired. RD BWL. Open well on 22/64 choke. Pressure at 2400 hours 1400 psi. Recovered a total of 820 bbls of fluid. LTR: 6779 bbls.
- 02/20/08 Completion day 52. Flow back well to pit on 14/64 choke. Rig up Halliburton to **Frac Zone 13**. Held safety meeting with all hands on location. Tested all lines and manifold to 9100 psi. All tested OK. Opened well and loaded hole with 119 bbls of clean city water. Formation broke at 7049 at 15.5 bpm. Pumped a total of 3788 bbls of fluid. Max. rate 42.1 bpm, av. rate 39 bpm. Max. pressure 8032 psi, av. pressure 6066 psi. **Pumped in formation 60,300 lb 30/50 PRC sand.** Traced all sand with Iridum. Final ISIP 4980, 5 min. 4678 psi, 10 min. 4569 psi, 15 min. 4507 psi. Good Job. RD and move out Halliburton and BWL. Released large diesel heater. Released 15 -500 bbl Frac Tanks. Greased 10K Frac Value. Filled up 8 frac tanks with filtered water out of the pit and will use on CO2 jobs. Open well to pit on 16 choke. Pressure at 4000 psi. Pressure at 2400 hours 2000 psi. Recovered during this period 1270 bbls. Left To Recover: 9297 bbls.
- 02/21/08 Completion day 53. Flow and flare well to pit. Open on 14 & 16 choke. Pressure at 2400 hours. Recovered a total of 2460 bbls during this period. Left To Recover: 6837 bbls.
- 02/22/08 Completion day 54. Continued to flow and flare well to pit. Well open on 14 choke. Recovered a total of 1440 bbls of fluid during this period. 5397 bbls left to recover.

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02/23/08 Completion day 55. Continue to Flare and Flow well to pit. Well open on 14/64 choke. Recovered a total of 1390 bbls of fluid during this period. 4007 bbls left to recover.

02/24/08 Completion day 56. Continue to flow and flare well to pit. Pressure at 2400 hours 800 psi. Recovered a total of 630 bbls of fluid during this period. Left To Recover: 3377 bbls.

02/25/08 Completion day 57. Continue to flow and flare well on 12 & 14 choke. Pressure at 2400 hours 1400 psi. Recovered a total of 440 bbls of fluid during this time. Left To Recover: 2937 bbls.

02/26/08 Completion day 58. Continued to flow well on 12/14 choke. Pressure at 2400 hours 1200 psi. Recovered a total of 240 bbls of fluid during this period. Left To Recover: 2697 bbls.

02/27/08 Completion day 59. No report.

02/28/08 Completion day 60. Flow well to pit on 14/13 choke. Pressure at noon 1000 psi. Move in, unload and hook up test separator. Problems with barton meter and a couple of values. Service hand due out this AM. Flow and Flare well to pit through separator. Pressure at 2400 hours 2000 psi. Recovered a total of 90 bbls of fluid during this period. Left To Recover: 2377 bbls.

02/29/08 Completion day 61. Flowing and flaring well through test separator. Continue to have problems with measurements from separator. Recovered a total of 342 bbls of fluid during this period. Left To Recover: 2035 bbls.

03/01/08 Completion day 62. Flowing and Flaring well through separator on 16 choke, Pressure at 2400 hours 1000 psi. Recovered a total of 672 bbls of fluid during this period. Left to Recover: 1363 bbls. Flowing at a rate of 2040 MCF/D.

03/02/08 Completion day 63. Flowing and Flaring well through test Separator. BJ Coil Services arrived on location at 0900 hours. Spotted unit on wellhead and began to rig up. BJ supervisor came in trailer and advised his crane was not large enough to pick up head and their BOP's. Discussed situation and decided to pick same up with the Rig blocks. After a 2 hour wait the supervisor came in trailer and advised we did not have the proper certified sling or shackle. I informed him it was not our responsibility to provide BJ with either of these items. BJ supervisor made several calls to his office and they decided to bring out a larger crane tomorrow AM. Shut well in for a pressure build up. S. I. pressure at 2400 hours 6000 psi.

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- 03/03/08 Completion day 64. Continued to flow well while waiting on BJ crane. Rigged up crane and rigged up coil unit. Very slow rigging up. Attempted to test BJ preventers. While trying to test crane operator picked up on stack breaking down test. Pressured up to 2000 psi. Will test to 7500 psi. Shut down for night. SI pressure at 2400 hours: 6400 psi.
- 03/04/08 Completion day 65. Well shut in waiting on coil crew. Pressure at 2400 hours: 6400 psi. Finished rigging up BJ coil. Tested BOP's and all lines to 7000 psi, OK. RIH with 4 1/2" 5 blade mill, motor assy & motor on 1 3/4" coil tubing. Didn't see plug that was supposed to be at 11,410'. RI & drill up plugs at 11,650', 12,000' & 12,465'. Stripper rubber leaking bad. Circ clean. Pull coil up hole with bit at 10,998' - above top perforations. Pump 50 bbl 10 ppg brine water down coil and work on stripper rubber. Rubber is frozen in sleeve. SDFN @ 7:00 pm.
- 03/05/08 Completion day 66. Well SI - SICP 3800 psi. Open well to pit to blow down pressure, pump warm water down tbg. Tbg slips frozen - open tbg slips. RIH with coil from 10,998' to 5th plug @ 12,985'. Drill on plug - motor stalled. PU 6 ft and pulled tight. Run back in to 12,981', set down - stuck pulling 42K - 13 times. Pump 500 cfm N2 with 1-3/4 bpm water - circ light fluid to surface. Cut N2 to 350 cfm, pulling up to 47K - 4 times. 5th time cut all fluids and pulled up to 47K. Pulled free. Pulled up to 12,728'. SD to try to change stripping rubber. Still unable to pull rubber - appears to be frozen in sleeve. RIH, drilled plugs 5 & 6. Had sand bridges at 13,413', 13,555', 16,638' (20' bridge), and 13,730'. Washed thru sand bridges. Tagged plug 7 @ 14,035', plug moving down hole to 14,400'. Started drilling on plugs, chokes plugged off. Pull up hole, circ. Cleared chokes. Pulled up to 10,993'. Circulating @ 2 1/2 bpm. Circ hole clean. Pumped 50 bbl 10# brine water down coil. Closed BOP and SI csg. valve. SDFN @ 10:00 pm.
- 03/06/08 Completion day 67. Well SI. SICP 4000 psi. Opened Well to pit - pressure down to 1400 psi within 5 min. BJ attempted again to change stripper rubber - leaking bad. Can't get window open - frozen. POH with tbg, motor and mill. Remove coil gooseneck with crane and set off. Thaw and replace stripper rubber. Disconnect tools - motor and mill have to be replaced. MU new 4 1/2" 5 blade mill, motor, and hyd., disconnect, jars, 2-7/8" motor head assemble. Connect tools and PT. Would not test. Had a hole in tubing above tools. Disconnect tools, cut off about 30' of crimped tubing, reconnect tools and PT. Transferred Coil from crane to rig. MU coil unit. RIH to 10,800'. Pumped 50 bbl 10# brine down tbg. SDFN @ 8:30 pm.

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- 03/07/08 Completion day 68. Well SI. SICP 4600 psi. Open well on 32 choke. Start in hole, circ @ 2 1/2 bpm. Drill up plug 8 @ 14,400', plug 9 @ 14,615', plug 10 @ 14,960' and plug 11 @ 15350'. RIH to PBTD @ 15,434'. Pumped 10 bbl sweep and circulated for 1/2 hr. POH, Circulating coming out. Hole clean. Disconnect from well head, LD Weatherford tools, blow coil dry. RD BJ Coil Tubing Unit and Crane. SDFN @ 11:00 pm.
- 03/08/08 Completion day 69. Well SI. Black Warrior Wireline on location @ 6:30 am. SICP 5400 psi. Open well on 32 choke & blow pressure down to 2400 while RU wireline. PU Weatherford 10K CBP & Setting Sleeve. Couldn't get top or bottom frac valves open all the way. Heating and working valves. Blew well pressure down to 400 psi and pumped methanol into valve while working valve. Finally got bottom valve fully open but lacked 2 turns of fully opening top frac valve. Worked wireline and was able to get BP thru valves. RIH and set Weatherford Composite Bridge Plug at 10,000'. POH with setting tool and RD wireline. Pressure down to 300 psi - started pumping water down casing. CP 1800 psi. Open to well on 16 choke; pressure down to 1400 psi - opened to 18 choke. Pressure down to 1000 psi - opened to 22 choke. Pressure down to 500 psi - opened to 28 choke. Pressure down to 400 psi - opened to 32 choke. Pressure down to 300 psi closed choke & pumped 150 bbl water down casing. Unbolt frac valve at Tbg. Head. PU frac valves and visually inspect the inside of the tubing head for any damage from sand - tbg head OK. MU frac valve on tbg head. Valves closed. SDFN @ 9:00 pm.
- 03/09/08 Completion day 70. Well SI. SICP 1800 psi, bled off pressure. Remove and load out 2 frac valves and spool. NU 10K BOP's. RU Mountain States Pressure Service snubbing unit. PU stand of DC. Break & LD collars. Number and tally tubing and rabbit tubing as the stands were picked up to run. Ran 4 1/2" bit (.33'), X-Over (.80'), Float Sub (.88'), POBS (1.24'), 1 jt 2 7/8" 6.5#, P-110 tbg (32.64'), XN Nipple (.88'), 1 jt. 2 7/8" 6.5#, P-110 tbg (32.78'), X nipple (.73'). RIH with 65 stands (4249.57') 2 7/8" 6.5#, P-110 tubing. Bit @ 4322'. Tbg and Csg are full of water. Installed TIW valve in tbg, Closed Csg valve and Closed BOP. Drained pump & lines. Well secure - SDFN @ 7:00 pm.
- 03/10/08 Completion day 71. Well shut in waiting on daylight. Snub in hole with 2 7/8" P-110 tubing to 10,058'. Tag Plug at 10,058'. Repairs to power swivel. Rig up power swivel and drill out plug at 10,058'. Pressure immediately went to 4600 psi after drilling plug. Bled down pressure to 2600 psi and continued in hole with tubing. Current depth is 11,691'. Secured well for night. Installed TIW value and SDFN. Flowing well during night to keep pressure down while snubbing in hole to land tubing.

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- 03/11/08 Completion day 72. Flow and Flare well to pit during night. Bleeding down pressure from 3400 psi to 1200 psi. Flowing on 40/32 choke. Recovered a total of 1600 bbls of water during this period. Continued to snub in hole with Mountain States Snubbing Services. Ran in hole with 474 joints of 2 7/8" P-110 tubing. Cleaned out to 15,404'. Have 1 damaged joint of tubing left on location. Picked up and laid down 9 joints of tubing. Made up hanger and landed same. E.O.T. at 15,075'. Pressure at 1500 to 2000psi while running in with tubing. Tighten lock in screws on tubing hanger. Rig Down Snubbing unit. Nipple Down BOP's, Nipple up 7 1/16" X 10 k upper tree. Test same to 10000 psi, ok. Attempting to pump off sub and bit. Key Well Service would not maintain any steady pressure due to seats and liners leaking. Finally got pressure to 3200 psi and it appeared sub was pumped off. Rigging down rig. Will release Key rig and move off location tomorrow. Released the following equipment today: Fork Lift, BOP's, Drill Collars, Washington Head, and all handling tools from Weatherford. Bit and pump off sub pumped off. Flowing back through tubing, well flowing on a 24 choke, recovered a total of 2200 bbls of water during this period. Pressure at 400 psi.
- 03/12/08 Completion day 73. Flow back well through tubing. Flowing on 24 choke. Pressure at 400 psi with well unloading water. 1000 psi on casing. Loading out rental tools. Released BOP's, Accumulator, Flanges, 4- drill collars, and all rental subs. Loaded out truck with rental fork lift. **Rig Released at 0900, 3-12-08.** Rig up PLS logging services and ran in hole with Protechnics tracer log. Logged from 15430' to 10700'. Results of log will be sent in to Greg Olson. SICP 3200 psi, SITP 2000 psi. Started bleeding down well to put in separator. At 2400 hours Flowing tubing pressure 1000 psi, casing pressure 1700 psi. Flowing well on 18/64 choke. Flowed a total of 1240 bbls of fluid during this period.
- 03/13/08 Completion day 74. Continued to flow and flare well through separator. Waiting on Natco to line out test separator. Flaring through separator while Natco adjusts charts and orifice plates on separator. Flaring well through test separator. Pressure on tubing at 2400 hours 1200 psi, casing 1800 psi. Flowed a total of 375 bbls of fluid during this period. Flowing at a rate of 2036 MCF/d. Cleaned up and bladed location.
- 03/14/08 Completion day 75. Testing well through test separator. Continue to flow well through test separator. Flowing well on 18 choke. Pressure at 1100 psi on tubing, pressure on casing 1700 psi. Well flowing at a rate of 1908 MCF/D.

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03/15/08 Completion day 76. Continued to flow well through test separator. Flowing tubing pressure 1000 psi, SICP 1700 psi. Flowing well on 18 choke. Made a total of 225 bbls of fluid during this period. Yesterday well flowed a total of 301 bbls of fluid. I failed to include this on the report. Flowing at a rate of 1950 MCF/D

03/16/08 Completion day 77. Continued to flow well through test separator. Flowing tubing pressure 1000 psi, SICP 1600 psi. Recovered a total of 218 bbls of fluid. Flowing at a rate of 1950 MCF/d.

03/17/08 Completion day 78. Flowing well through test separator. Pressure on tubing 1000 psi, SICP 1600. Flowing at a rate of 1950 MCF/d. Well shut in while moving separator away from well head. Could not move it until now due to Key Well Services pump and tank in the way. Setting up flare stack along with rigging up separator. Flowing well to pit while waiting on daylight to finish hooking up flare stack and separator. Flowing tubing pressure 800 psi, SICP 1400 psi.

03/18/08 Completion day 79. Completed hook up on flare stack and separator. Testing well through separator. Flowing tubing pressure at 2400 hours 1000 psi. SICP 1600 psi. Recovered a total of 135 bbls of fluid during this period. At 2400 hours flowing at a rate of 1031 MCF/d on 18 choke.

03/19/08 Completion day 80. Continue to test well through separator on 18 choke. Flowed back a total of 199 bbls of fluid during this period. At 2400 hours flowing tubing pressure 800 psi, SICP 1400 psi. 912 MCF/dd

03/20/08 Completion day 81. Continued to flow test well through separator. Flowing tubing pressure 800 psi. SICP 1400 psi. Flowed back a total of 192 bbls of fluid during this period. 912 MCF/d

03/21/08 Completion day 82. Continued to test well through test separator. Flowing tubing pressure 800 psi, SICP 1400 psi. Recovered a total of 195 bbls of fluid during this period. 912 MCF/d

03/22/08 Completion day 83. Continued to test well through test separator. Flowing tubing pressure at 800 psi, SICP 1400 psi. Flowed back a total of 195 bbls of fluid during this period. 949 MCF/d

03/23/08 Completion day 84. Continued to test well through test separator. Flowing tubing pressure 800 psi, SICP 1400 psi. Recovered a total of 186 bbls of fluid during this period. 1026 MCF/d



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03/24/08 Completion day 85. Continue to test well on 18 choke through test separator. Flowing tubing pressure 800 psi, SITP 1300 psi. Recovered a total of 182 bbls of fluid during this period. 1071 MCF/d.

03/25/08 Completion day 86. Continue to test well. Flowed back a total of 179 bbls of water during this period. Flowing tubing pressure 800 psi, SICP 1300 psi. 1117 MCF/d

03/26/08 Completion day 87. Flow test well through test separator. Flowing tubing pressure 800 psi, SICP 1300 psi. Flowed back a total of 187 bbls of fluid during this period. 1064 MCF/d

03/27/08 Completion day 88. Continued to test well through separator. Visually, well appears to be making more gas and water than the separator meters are showing. Ordered out a new calibrated meter for replacement and old meter was not correctly measuring gas. At 1400 hours after the meter was changed the correct reading is 1733 MCF/d. At 2400 hours 1854 MCF/d, on 18 choke. Flowing tubing pressure 800 psi, SICP 1300 psi. 187 water during this period.

03/28/08 Completion day 89. No report.

03/29/08 Completion day 90. Continue to test well through separator. Flowing tubing pressure 750 psi, SICP 1250 psi. Recovered a total of 151 bbls of fluid during this period. Resistivity 550, 1854 MCF/d.

03/30/08 Completion day 91. Continue to test well. Flowing tubing pressure at 2400 hours 700 psi, SICP 1300 psi. Recovered a total of 140 bbls of fluid during this period. At 2400 hours rate at 1677 MCF/d. Low tubing pressure at 1800 hours 650 psi. Low casing pressure at 1800 hours 1250 psi. Rate at 1900 hours 1565 MCF/d. Resistivity: 1500

03/31/08 Completion day 92. Continue to test well on 18 choke. Flowing tubing pressure 750 psi, SICP 1250 psi. Recovered a total of 156 bbls of fluid during this period. 1564 MCF/d

04/01/08 Completion day 93. Continued to flow well on 18 choke. Flowing tubing pressure 700 psi, SICP 12550 psi. Recovered a total of 136 bbls of fluid during this period. 1416 MCF/d

04/02/08 Completion day 94. Continue to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 135 bbls of fluid during this period. 1551 MCF/d

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

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FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____	5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc	6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 999 18th St., Ste. 600 CITY Denver STATE CO ZIP 80202	7. UNIT or CA AGREEMENT NAME: N/A
PHONE NUMBER: (303) 297-2300	8. WELL NAME and NUMBER: RYE PATCH FED 24-21
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M	9. API NUMBER: 43-013-33443
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E	10. FIELD AND POOL, OR WILDCAT: undesignated
COUNTY: DUCHESNE	STATE: UTAH

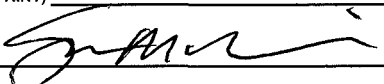
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: Status
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada spud the subject well on 8/24/2007  
09/24/2007 - drilling ahead  
10/21/2007 - TD well at 15,500'  
11/21/2007 - Released drilling rig  
12/31/2007 - Commenced completion operations  
01/31/2008 - Flowing to pit  
02/29/2008 - Flowing and flaring well to pit  
03/29/2008 - Flow test through separator  
04/02/2008 - Continue to test well  
05/06/2008 - Continue to complete well

Attached please find a complete chronological well report.

NAME (PLEASE PRINT) Susan Miller	TITLE Regulatory Analyst
SIGNATURE 	DATE 5/6/2008

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Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Excalibur Well No. 15718, AFE No. 1714  
Daily Reports  
TIGHT HOLE

Densilog/Neutronlog. Set plug at 11,040'. Picked up 100' and Ran in and tagged solid at top of plug at 11,040'. Pulled out of hole with setting tool. Laid down lubricator. ND BOP's. Remove leaking Frac Valve and replace with newly tested Frac Plug. Pick up lubricator and RIH with a 11'-- 4" casing gun, 120 degree phasing, 23.5 gm, .43 dia. (35" penetration). **Perforated from 10,932' to 10,943'** with 2 SPF. Pull out of hole, all shots fired. RD BWWL.

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TIGHT HOLE

parted. Did not pull out of the rope socket but had parted leaving in hole cable head, 2-7' weight bars, CCL, and setting tool. Well immediately began to blow and unloaded the hole. Blew out all of the tools left in hole plus approximately 25' of wire. Shut in blind rams and secured well. No injuries, no fluid touched the ground. Rigged down Wire Line. Inspected rig for damage. Found 2 girts in the derrick damaged. Laid down derrick for further inspection. Ordered out Certified derrick inspector to check out same. Inspector arrived and said repairs could be done on location in 2 to 3 days. Well Shut in and secure.

- 04/29/08 Completion day 121. Well Shut in. Wait on coiled tubing unit. Repairs to derrick. Changing out 2 girts and cross members in derrick. SICP 3000 psi. Well shut in.
- 04/30/08 Completion day 122. Well shut in. SICP 4600 psi. Waiting on Coil Unit to clean out to TD.
- 05/01/08 Completion day 123. Shut in for night. SICP 5100 psi. Halliburton Coil Tubing Unit arrived on location. Spotted Coil equipment to well head and rigged up. Wait on daylight
- 05/02/08 Completion day 124. Shut in for night. SICP 5100 psi. Bleed down casing while finish rigging up coil unit. Make up Weatherford motor and 4 1/2" drag bit. HELD SAFETY MEETING. Filled coil with clean fresh water from storage tanks on location. Tested tools to coil to 25K, pressure test to 2500, function test 1.5 BPM/2000 psi. RIH with coil to 15,402. Circulating out slight traces of sand. Recovered several small pieces of rubber and metal from Wire Line tools. Pump Rate 2 BPM while running in hole. Pumped 19 bbls pill on bottom and circulated out same. Start out of hole with Coil. RD Halliburton Coil Unit and released same. Shut down for night.
- 05/03/08 Completion day 125. Wait on Daylight. Move in and rig up BWWL. Install lubricator with crane. Make up Gauge ring and junk basket. Attempt to RIH with same. Could not get past well head due to a ice plug from flowing the well back. Unable to locate hot oiler. Sent crew home until Monday. Will rig up tarp and heater to thaw out well head. Well shut in with heater and tarp thawing out well head.
- 05/04/08 Completion day 126. Thawing out well head.
- 05/05/08 Completion day 127. SDFN. Loaded 2 Mountain Movers with sand. Preparing to Frac in the AM. Wait on Daylight. Move in and rig up BWWL. Make up 5 1/2" Solid composite plug and run in hole. Tagged a soft fill at 945'. Worked in hole slowly to 12500'. Correlated to

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- 04/23/08 Completion day 115. Wait on daylight. Well shut in. SITP & SICP 6000 psi. Hook up hot oiler and thaw out well head. Install BPV. RD lubricator. Install Flange on Frac valve and NU BOP's. RU Mountain States Snubbing services. Bleed down well pressure from 6000 psi to 3000 psi on 18 choke. Flowing back dry gas with no water. Pump 50 bbls water down tubing to top kill well. POH w/ Snubbing unit 65 jts of 2-7/8" tubing, laying down. Tubing stands too tall to pull. Well shut-in. ISIP on casing 1400 psi.
- 04/24/08 Completion day 116. Wait on Daylight. Flowing well. SICP 4400 psi @ 5:00 w/ 12 choke. SICP 3300 psi @ 6:00 w/ 15 choke. SICP 2800 psi @ 7:00 w/ 18 choke. Pump 50 bbls water to top kill tubing. POH with Snubbing unit 94 jts (156 total). EOT approximately 10005 ft. Estimate 45-50 Bbls water recovered to pit during snubbing operations. Wait on Wireline truck to run production logs. Flowback well overnight. Recovered 39 Bbls of water by 24:00.
- 04/25/08 Completion day 117. Flowback well to relieve pressure and remove water for wireline production logs. Recovered 45 Bbls water in 7 hrs. Casing Pressure 900 psi. Wait on wireline logs. Maintain well flowing back on 14 choke. R/U and run wireline production logs. R/D Production logging equipment and attempt to set 2-7/8" tubing plug in x/n nipple.
- 04/26/08 Completion day 118. Attempt to set tubing plug. Main pulley on wireline truck seized. POH w/ wireline and wait on replacement pulley. Wait on replacement pulley for wireline truck. Attempt to set tubing plug in x/n nipple. Set tubing plug in x nipple. R/D wireline truck. Shut in well, WOD. Shut in well.
- 04/27/08 Completion day 119. Wait on Daylight. SICP 3400 psi. Opened gradually to 14 choke. R/U catwalk and pipe racks. Safety Meeting. POH 318 jts w/ Snubbing unit. R/D Snubbing unit. SICP 600 psi. Shut in well and wait for daylight.
- 04/28/08 Completion day 120. Wait on Daylight. RU Black Warrior W.L. Install Lubricator. Make up and RIH to 60' with Gauge Ring and Junk Basket. Pulled out of hole. Junk Basket full of sand. Lay down ring and basket. Made up 5 1/2" Composite Bridge Plug and start in hole. At 9800' tagged fill. Worked through same and ran in to the collar below 11040'. Tools appear to be sticky. Attempted to set plug at 11,040'. Plug appeared to set. Pull up 100', again very sticky. Ran in to 11,040 and set down on what was thought to be the plug. Bled down well. Well bled down to 0 pressure but had a slight blow. Started out of the hole. At 3000' had no line weight. Indications were the line had pulled out of the rope socket. Well continued to have slight blow. Finished out of the hole and line had

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Excalibur Well No. 15718, AFE No. 1714  
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04/13/08 Completion day 105. Continue to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200.

04/14/08 Completion day 106. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.

04/15/08 Completion day 107. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.

04/16/08 Completion day 108. Continued to test well on 18 choke. Flowing tubing pressure dropped to 650 psi and SICP dropped to 1100 psi.

04/17/08 Completion day 109. Continue to test well on 18 choke. Flowing tubing pressure 600 psi, SICP 1100 psi.

04/18/08 Completion day 110. Continue to test well on 18 choke. Flowing tubing pressure 600 psi, SICP 1100 psi. Shut well in at 1200 noon. Rig due in today but has been delayed until Monday. Rigged down Premier Flow Back Services and released same. Released at 1700 hours on 4-18-08. Rigged up bleed down line from well head to pit through manifold. Separator and flare stack still rigged up. SITP 2600 psi, SICP 2900 psi.

04/19/08 Completion day 111. Well shut in waiting on Rig. SICP 5000 psi, SITP 5000 psi. 5000 psi gauges on tree. Will install 10000 psi gauges

04/20/08 Completion day 112. Waiting on Rig. Well Shut In. 5000 psi gauges maxed out at 5000 psi on both tubing and casing. Will change out today.

04/21/08 Completion day 113. Move in Excell Services Rig and Rig up. Changed 5000 psi gauges to 10000 psi gauges. SICP; 5600 psi, SITP 5600 psi. Rig up Lubricator and run BPV. Bleed down pressure. BPV holding. ND Tree. Install 10 K Frac valve. Break down and install bottom valve from tree on top of Frac Valve as a safety precaution. Pull BPV. Frac Valve leaking. SDFN. Will replace Frac valve tomorrow.

04/22/08 Completion day 114. Waiting on Frac Valve. SICP 5600 psi and SITP, 5600 psi. Rigged up Lubricator and set BPV. BPV held okay. Removed leaking Frac Valve. Installed new Frac valve. Pulled BPV and checked same. Attempt to re-run BPV before installing flange and BOP's. Unable to make up BPV due to freezing in well head. Pumped in Methenol and waited 1 hour. Unable to get BPV in to hanger. Rig up pump and tank. Ordered out hot oiler for tomorrow AM. Will attempt to thaw out well head. Shut down for night

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03/29/08	Completion day 90. Continue to test well through separator. Flowing tubing pressure 750 psi, SICP 1250 psi.
03/30/08	Completion day 91. Continue to test well. Flowing tubing pressure at 2400 hours 700 psi, SICP 1300 psi.
03/31/08	Completion day 92. Continue to test well on 18 choke. Flowing tubing pressure 750 psi, SICP 1250 psi.
04/01/08	Completion day 93. Continued to flow well on 18 choke. Flowing tubing pressure 700 psi, SICP 12550 psi.
04/02/08	Completion day 94. Continue to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.
04/03/08	Completion day 95. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/04/08	Completion day 96. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/05/08	Completion day 97. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1250 psi.
04/06/08	Completion day 98. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/07/08	Completion day 99. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/08/08	Completion day 100. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/09/08	Completion day 101. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.
04/10/08	Completion day 102. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi.
04/11/08	Completion day 103. Continued to Test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.
04/12/08	Completion day 104. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi.

STATE OF UTAH  
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FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS

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1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 999 18th St., Ste. 600 CITY Denver STATE CO ZIP 80202		7. UNIT or CA AGREEMENT NAME: N/A
PHONE NUMBER: (303) 297-2300		8. WELL NAME and NUMBER: RYE PATCH FED 24-21
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M COUNTY: DUCHESNE QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E STATE: UTAH		9. API NUMBER: 43-013-33443
		10. FIELD AND POOL, OR WILDCAT: undesignated

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: <u>Current Status</u>
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

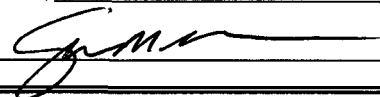
Petro-Canada spud the noted well at 2200 hrs on 08/18/2007.

Completion operations were commenced on 12/31/2007.

As of 06/18/2008:

Petro-Canada is continuing completion operations.

Attached please find a chronological well completion report to date.

NAME (PLEASE PRINT) <u>Susan Miller</u>	TITLE <u>Regulatory Analyst</u>
SIGNATURE 	DATE <u>6/18/2008</u>

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Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Daily Reports  
TIGHT HOLE

**COMPLETION REPORTS –**

- 12/31/07 Completion day 1. Well Shut in. Opened well to flow back tank at 1530 and flowed back to tank. SI pressure was 2200 psi. Opened well on 10 choke. Well flowed back gas with small amounts of fluids. Unable to get measurement on fluid due to frozen tank bottoms. Very little fluid during this flow back period.
- 01/01/08 Completion day 2. No report.
- 01/02/08 Completion day 3. Well flowing gas to flow back tank on 10 choke. Traces of water but not enough to measure. Crews arrived and we put well to pit on 10 choke. Ignited gas and had strong blow with a 10' to 12' flare. Flare is steady with slight heads of water. Again water is not strong enough to put out flare. Pressure has slightly increased to 1050 to 1100 psi. Moved in and RU BWWL. RIH with GR and logged from 15378' to 8000'. Indications are that we have fill up above where we need to set Frac Plug. Will need to RIH with Bit & Scraper and clean out to below 15,400'. Having a very difficult time trying to correlate logs. RD BWWL. Continued to flare well on 10 choke. Pressure has increased to 1100 psi. Have a good 10' to 12' flare with small amounts of water.
- 01/03/08 Completion day 4. Continued to Flare well to pit. Pressure holding at 1100 psi. Flaring well on 10 choke. No fluid recovery. Finished rigging down BWWL and releasing them. Thawed out BOP's and Nipped up same. Preparing to kill well in the AM with 2% KCL and RIH to clean out to TD. Continue to Flare well to pit on 10 choke. Pressure remains to be a steady 1100 psi. Well is not making any fluid. Flaring with a 10' to 12' flare. No signs of oil or condensate.
- 01/04/08 Completion day 5. Change out gauges on manifold.
- 01/05/08 Completion day 6. Continued to flair well to pit. Flowing on a 13 choke with pressures at 1050. Manifold and all lines freezing up. Hooked up large diesel heater and tarped manifold. At 1100 hours shut well in due to high winds. Unable to keep gas burning. Moved in and rigged up Coil tubing services. At 1700 hours finished RU Coil Services and opened well to pit. Pressure at 145 psi, on 12 choke. Flared well with good 12' to 14' flair.
- 01/06/08 Completion day 7. Flared well to pit on 12 choke, pressure at 1200 psi. No fluid recovery during this period. Finish rigging up coil unit. Hooked up to water tank, tank holding 500 bbls of 145 degree 2% KCL water. Held Safety Meeting. Make up 4 1/2" drag bit, XO, 2 7/8" PDC Motor and start in hole with 1-3/4" coil tubing. Tagged fill at 15,415'. Circulating with 2% KCL and 500 SCF of N2. Washed down to 15,442'. Sand was firm

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to hard taking 4 to 5K to wash. Pumping at a rate of 2.25 BPM. Flowing back N2 and water. Pressure at 300 to 500 psi. Flowing back to flow back tank. Pumped a total of 525 bbls of water. Indications are we are on the Float Shoe at 15,442'. Circulate hole clean, pressure at 300 psi, well unloading water. POH with coil tubing. Dried out coil tubing with N2, rigged down and released coil unit. Pumped a total of 525 bbls of fluid. Recovered a total of 256 bbls at 2200. 269 bbls left to recover. Flowing well to pit. Heavy snowfall for the past 2 days. Snowed over 2' in past 36 hours and still snowing. Equipment having trouble on the roads from here to Roosevelt and Vernal. Having to assist some of our equipment in and out of the location. Flowing well back to flow back tank on 15 choke 400 psi, recovered a total of 229 bbls of water. Correction on water used to circulate with. Pumped a total of 500 bbls. Have now recovered a total of 270 bbls. Left to recover is 229 bbls.

- 01/07/08 Completion day 8. Thawed out Frac Valve while rigging up BWWL to run GR log to determine where perforations are and see where Frac went. RIH with log and tagged bottom at 15434'. Log from 14,000' to TD. POH and RD WL. Thaw out flow lines and open well on 21 choke. Pressure at 1300 psi. Continue to flow and flair well to pit. Choke size ranging from 21 to 15 in attempt to unload water. No fluid recovery during this period. Pressure at 2400 hours is 1300 psi.
- 01/08/08 Completion day 9. Continued to flair well to pit. Pressures ranging from 1300 psi down to 1150 psi. Adjusting choke size as needed to keep well from freezing up. Temperature at -8 degrees at midnight, with a light snow. Choke size decreased from 18 down to 14. No fluid recovery during this period.
- 01/09/08 Completion day 10. Continued to flair well while waiting on flange to rig up Slick Line Truck to run tracer log. Protechnics was informed of what they would need to rig up. RU and RIH to trace 1st Frac. Traced Iridium and results looked the same as on GR log. Log will be sent to Greg in Denver office tonight. RD Slick line and RU BWWL. Made up composite BP and perforating gun and ran in hole. Set plug at 15,350'. **Perforated bottom zone at 15,325 to 15,330'**. Perforated with 4" casing gun 23.5 gm and .43 dia. Shot 2 SPF. POH, LD gun, all shots fired. Picked up loaded guns and ran in hole. **Perforated from 15,250 to 15,255', 15,050 to 15,058, and 14,994 to 14,998'**. All shots were 2 SPF. Pulled out of hole and all shots fired. Used extreme caution while correlating before setting plug and perforating. RD BWWL. Left logging truck and equipment on site to be ready for next zone on Friday PM. Well shut in for Frac on Friday, 01/11/08.
- 01/10/08 Completion day 11. Well shut in while preparing to Frac.

Rye Patch Fed 24-21  
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TIGHT HOLE

- 01/11/08 Completion day 12. Well shut in for Frac. Opened well and attempted to bleed down pressure. Pressure at 1850 psi, flared well to pit while waiting on Halliburton. Pressure holding at 1800 on 12 to 14 choke. Left well open until noon. Pressure at 1650 and still blowing hard on 14 choke. Moved in Halliburton Frac equipment to **Frac zone 3**. Waiting on Halliburton generator to run Tech Command Center. Finished RU Halliburton. Held safety Meeting, tested all lines to 9800 psi. Loaded hole with 221 bbls of fresh water and 1000 gallons of 15% Acid. Pressured up to 10000 psi and could not break down formation. Let pressure bleed down to 7500 psi and brought pressure back up to 10 K rapidly but formation would not break down. Discussed problem with Halliburton and P/C Drilling Manager who is on location and it was decided to get 15 K iron brought to location. Opened well to pit at 1500 hours to flow back frac water. Pressure at 6800 psi. Pressure bled down to 0 recovering 110 bbls of fluid with 111 bbls left to recover.
- 01/12/08 Completion day 13. No report.
- 01/13/08 Completion day 14. Well open venting gas with 1000 psi on 14 choke. No fluid recovered during this period. Shut well in at 0700 to rig up Stinger. Move in and rig up Stinger. Rigging up Halliburton 15 K lines. Waiting on a 15 K floor valve from Vernal. Held safety meeting. Tested all lines to 12700 psi. Loaded hole with clean fresh filtered water and 1000 gallons of 15% Acid. Pump in pressures very high. Max psi 12004, Average pressure 9570 psi, Max. pumping rate 38.5 bpm, average pumping rate 29.1 bpm. Pressure rise once 0.5 #/gal sand hit formation. Pumped approx. 37% of designated sand amount. 33.5% in formation, 134 sacks of 30/60 bauxite in formation and 17.5 sacks left in casing (150'). Traced all sand with Protechnics. Traced with SB-124 ZW (Antimony). ISIP 10370 psi, 5 Min. 8535, 10 min. 8537 psi, 15 min. 8541 psi. This was a Mancos Frac in Zone 3. Total fluid pumped 1884 bbls. RD Halliburton, RD Stinger. Covered well head with tarps and hooked up 2 heaters to keep well head from freezing. Opened well on 24 choke. Pressure bled from 7000 psi to 0 in 45 minutes.
- 01/14/08 Completion day 15. Well open on 24 choke, 0 pressure with a medium blow. Flowed back a total of 160 bbls of frac water. Rigging up Halliburton. Supervisor advised that he would be unable to Frac today due to mechanical problems with 2 of his pumpers. Rig them down and took same to town for repairs. RU BWWL and ran in hole with 4.0 Gauge Ring and Junk Basket. Ran in slowly while checking for frac sand that was supposedly in casing. Ran in to 14,970' and did not tag sand. POH with W.L. Made up Halliburton Flow through Plug and perforating gun and ran in hole. Set Flow Through plug at 14,960'. Pulled up and perforated at 14,913' to 14,918'. Perforated 2 SPF with 4" casing gun. Pulled out of hole. All shots fired. LD setting tool and made up Second

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gun. RIH and **perforated 14,788' to 14,803' and from 14,720 to 14,725'**. All with 2 SPF. POH all shots fired. RD BWWL. Open well on 18 choke, pressure at 2200 psi, bled down to pit. Recovered 44 bbls of frac fluid.

- 01/15/08 Completion day 16. Well open on 18 choke, 0 pressure with medium blow. Recovered 46 bbls of frac fluid. Move in and rig up Stinger. Sting in wellhead. Move in and rig up Halliburton to Frac Zone 4. Halliburton had problems with lines, hoppers, and hoses being frozen. Began testing lines. It took 2 hours to repair leaks in Halliburton Equipment. Held safety meeting and finished testing lines to 12,200 psi. **Frac Zone 4** with 3440 bbls of fresh clean city water. Pumped a total of 56,500# of 30/50 ceramic bauxite. Broke formation down at 10800 psi. Max. psi 11006, average psi 9344 with maximum rate for short period was 35.34 bpm, average rate was 29.49 bpm. Lost 1 pump at the beginning of the job and made repairs on 2 others on the fly. Traced all sand with IRIDUM (IR-192 ZW). Final ISIP 8027 psi, Final Frac Gradient 0.98, ISIP 5 min. 7870, 10 min. 7796, 15 min. 7747. RD Halliburton, Sending pumps to town for repairs. RD Stinger. Sent Stinger to town. Note: design rate of 40 BPM could not be achieved due to malfunctioning pump trucks. LA pump on blender was lost during 0.75#/gal sand stage, FR was manually trickled into blender tub. 2 other pumpers were worked on during job. Run in hole with BWWL. Run in with Flow through plug and perforating gun. Pressure at 7600 psi when starting in hole. Pressure began to increase and at 8500' pressure was at 10K plus. Started pulling out of hole slowly. Pulled up lubricator. Tools would not go in lubricator due to ice plug. Tools in master valve. Waiting on hot oiler. Continue to wait on Hot Oiler to thaw out Lubricator.
- 01/16/08 Completion day 17. Waiting on Hot Oiler, called 7 different companies trying to get 1 to location and they are all busy due to the very frigid weather. High pressure pump arrived at 1500 hours. Pumped in 150 gallons of methanol. Appears now that along with ice plug the rams are partially closed not allowing the tools to get all the way into the Lubricator. BWWL sending out specialist from Wyoming to bleed down pressure that is trapped behind rams. Hot Oiler arrived and heated Lubricator, still could not get tools up in Lubricator. Tools hanging in aster valve. Flowing well to keep pressure down. Pressure at 2000 psi at 2400 hours.
- 01/17/08 Completion day 18. Trying to free up tools. Warmed up Lubricator and well head all night with hot oiler. No ice in either. Continued to flow well to pit. Pressure a 2400 hours 5000 psi. Flowing on 14 choke. Thawed out rig pump and lines and pumped 80 bbls of 2% KCL down hole. Pump pressure 1000 psi at 4 BPM. Did not pressure up at tools at 112'. Changing out hydraulic hoses on 10K trailer. Opened up relief valve on top of Lubricator and pressure dropped to 0 indicating rams are CLOSED.

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This is why line will not go up or down. Rigged up a high pressure manual pump and hooked to 10 K BOP. Pressured up to 4000 psi and one side of preventers opened. Pulled tools up from 112' to 7', 8'. Hooked up to other side and trying to open. Continued to get ram to open with no success. 10 K specialists now saying a bolt is broken behind the ram not allowing it to fully open. Began trying to bleed down well in order to get tools out of the hole. Started on 24 choke and ended with full opening. Well continues to flow gas and pressure will not bleed to 0.

- 01/18/08 Completion day 19. Completion day 18. Continued to blow down well while trying to get 10 K rams open 1 ram seems to be 1/2 open. Unable to get wire line tools through Lubricator. In hole is a Flow Through Frac plug, setting tool and a 5' perforating gun. Pressure is at 0 but well still making gas. Estimate is approx. 200 to 300 mcf. Top of tool is at 7.6' in Lubricator. Opened bleed of valve at top of Lubricator, bleed down gas. Gas in Lubricator is partially frozen, backed of Lubricator below rams. Pulled up in to top of derrick with Lubricator clearing the tools above the frac valve. Closed Frac valve immediately and secured well. Laid down tools and Lubricator. As suspected 1 ram was partially open which would not allow tools to enter into the Lubricator. RD BWWL and 10 K Lubricator. Sent both to town. Well shut in while rigging down WL. Continued to fill Frac Tanks for next Frac on Tuesday. Filling a total of 23 500 bbls tanks. Continued to flow back well. Opened with 1150 psi, on 14 choke. At 2400 hours pressure at 300 psi on 14 choke.
- 01/19/08 Completion day 20. Flowing back well to pit. Pressure at 300 psi on 14 choke. Very little water recovered during this period. Changed to a 12 choke. Flaring to pit. Had about a 2 bbl kick of water. Caught a sample and tested resistivity @ 450. Pressure @ 400 psi on 12 choke. Flowing back well to pit. Pressure at 400 psi on 12 choke. Water TTR is 5515 bbls and recovered 764 bbls with 4751 bbls LTR.
- 01/20/08 Completion day 21. Flaring to pit. Pressure 400 psi on 12 choke. No measurable water.
- 01/21/08 Completion day 22. Flaring to pit. Pressure 400 psi on a 12 choke. No water. Flaring to pit. Pressure 350 psi on 12 choke. Light trace of water at 17:00. Sample caught and tested at 600 grains of sodium, temp. 70, holms .6. Flaring to pit. Pressure varied from 350 to 400 psi on 12 choke. Traces of water at 350 but no measurable amount.
- 01/22/08 Completion day 23. Flaring to pit. Pressure varies from 350 - 400 psi. Light trace of water at 350.
- 01/23/08 Completion day 24. Flaring well to pit, pressure at 1600 psi on 12 choke, no fluid to surface. Halliburton arrived on location at 1500 hours and

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spotted Frac equipment on location. Rigged up 10 K lines to well head. Stinger arrived at location at 1400 hours. Spotted tools next to well head and will run in with stinger in the morning. Frac scheduled to begin at 0700. Flaring well to pit on 12 choke.

- 01/24/08 Completion day 25. Continued to flare well on 12 choke. Pressure at 1200 psi at 0600 hours. Move in and RU Stinger and Halliburton. Tested Halliburton lines and valves to 12,500 psi. Opened well and loaded hole with 1000 gallons of 15% acid. Formation broke down at 12,095 psi at 40 BPM. Pumped a total of 2445 bbls of fluid. Average pumping rate 39.2 BBP, Max. rate 41.1 bpm, Max. pressure 12,095 psi, average pressure 9,409 psi. Pumped 28,700 lbs of 30/50 ceramic prop. Max. at 1.50 ppg. Traced sand with Sc-46 (scandium). ISIP 7900 psi, 5 min. 7724 psi, 10 min. 7683 psi, 15 min. 7655 psi. RD Stinger. RU BWL. Rigged up 10 K lubricator. Made up Flow through Frac Plug and perforating gun. Attempted to run in hole but tools would not fall due to high well pressures. Picked up weight bar and bleed down pressure on well to 5100 psi. Was able to run in hole at a slow pace. Set Plug at 14,400'. **Perforated at 14,382' to 14,387' & from 14,315' to 14,320'.** All with 2 SPF. Pulled out and laid down setting tool and guns. Made 2nd run with guns and **perforated from 14,203' to 14,208' & from 14,156' to 14,161' & 14,108' to 14,113'.** All shots at 2 SPF, all shots fired. POH, RD BWL. RU Halliburton and tested lines and valves to 12,500 psi. Opened well and pumped 1000 gal of 15% Acid. Broke down formation at 9530 psi with 8.6 bpm. Maximum psi 10,595, avg. psi 9,425, max. rate 40.3 bpm, avg rate 30.1. Pumped a total of 1787 bbls of clean city water. Pumped a total of 15,130 lb of 30/50 ceramic prop in formation. Frac Gradient 0.96. ISIP 7,42, 5 min. 7375 psi, 10 min. 7353 psi, 15 min. 7337 psi. Lost sand cap on 2 trucks during pad, shut down to repair. Unable to get designed rate, truck lost packing. Called flush after .5 #/gal, another truck was getting ready to drop out. Flushed with 1000 gal overflush. Traced sand with Sb124 (antimony). RD Halliburton. Open well on 10 choke to pit. Have pumped in a total load of 9647 bbls. Have recovered a total of 707 bbls. 8940 bbls left to recover.
- 01/25/08 Completion day 26. No report.
- 01/26/08 Completion day 27. Flow back well on 10 & 12 choke. Pressures from 1000 psi to 950 psi. Recovered a total of 740 bbls in 24 hours. Left to recover 5952 bbls.
- 01/27/08 Completion day 28. Flowing back well to pit. Pressure at 900 psi on 8 choke. Recovered 460 bbls of fluid in 24 hours. Left to recover 5492 bbls.

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- 01/28/08 Completion day 29. Flow well to pit on 8 choke, pressure atr 900 psi. RU BWWL, RIH with Flow Through Plug and perforating guns. Set Plug at 14000'. Perforated from **13,898' to 13,906'**. Shot 2 SPF, all shots fired. Ran 2nd gun and perforated from **13,792' to 13,800', and from 13,730' to 13,738'**. All shots 2 SPF, POH, all shots fired. RD BWWL. Well shut in while hot oiler heating tanks. Strong winds blowing gas and water directly over hot oil unit. Heavy snow fall and high winds have roads closed in and out of location. SICP at 2400 hours 3800 psi.
- 01/29/08 Completion day 30. Flow back well. Halliburton moved in 3 pump trucks. Halliburton moved in equipment. Scheduled to began Frac at 0600 hours. Continued to flow and flair well to pit. Pressures dropped from a SI of 4600 psi to 400 psi, flowing on chokes of 12 down to a 6. Recovered a total of 150 bbls of fluid in 24 hours. Total LTR 5342 bbls.
- 01/30/08 Completion day 31. Flow & flair well to pit. Stinger arrived and installed stinger at 0600. Wait on Halliburton crew to arrive. They were supposed to be on location and ready to pump at 0600. Crew got lost, not familiar with area as they are from Bakersfield, CA. Finish RU Halliburton, held Safety Meeting. Tested all lines to 12,500 psi. Thawed several ice plugs from lines and manifold. Pumped 1000 gallons of 15 % Acid. Formation broke at 9862 psi at 26.5 BPM. Pumped in a total of 4000# of sand. Only got in .25# before well screened out. Sand is 30/50 ceramic. Max. psi 12,350, Average pressure 9,879. Average rate 26 bpm, max. rate 42 bpm. Frac Gradient 1.09 psi/ft. Pumped a total of 1278 bbls of fluid. ISIP 8944, 5 min. 7677 psi, 10 min. 7642 psi, 15 min. 7612. Traced sand with IR-192 (Iridium). RD Stinger and moved away from well head. RD Halliburton from well head. RU BWWL. Make up 10 K lubricator and RIH with Flow Through Plug and 2 - 5' perforating guns. Set plug at 13,620'. Picked up 30', ran back and tagged plug. Plug in place. Perforated **13,510 to 13,13,515., & 13,462 to 13,467**. Shot at 2 SPF. Pulled out of hole. Made up guns and Ran hole. Perforated from **13,335 to 13,340. & 13,305 to 13,310, & 13,082 to 13,087'**. All perforations shot at 2 SPF. POH, laid down guns, all shots fired. RD BWWL, leaving lubricator hanging in derrick. Pumped in a total of 1278 bbls during this stage. Total left to recover now is 6620 BBLS. Opened well on 10 choke. Tarping well head and firing up heaters to keep from freezing. NOTE ON FRAC: Due to problem with the liquid additives pump on the blender, the job was shut down for a few minutes during pad stage to fix it before completing the pad volume. Job proppant volume shown on ifs was inaccurate due to densometer not reading the proppant concentration right. Called flush early after the well screened out at the beginning of the 0.5 sand stage. Opened well on 12 choke at 2200 hours. Starting pressure 4000 psi, bled down to 900 psi at 0600 hours. Recovered a total of 360 bbls of water during this flow back. Correction, recovered a total of 420 bbls during this period. Left To Recover 6200 bbls.

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- 01/31/08 Completion day 32. Flowing well to pit on 12 choke. Pressure at 900 psi. Move in and rig up stinger. Sting into well head. RU Halliburton to well head, Held Safety Meeting. Pressure tested all lines and manifold to 12,500 PSI. Pumped 95 bbls of water to fill casing. Formation broke at 10,348 at 15 bpm. Pumped 1000 gals of 15% Acid. Pumped a total of 2803 bbls of water, pumped in 32,096 # of 30/50 ceramic. Job was designed for a total of 50,000 # of sand. Pumped in all of .25, .50, and .75 # sand. Went to flush due to problems with blender and IFS. Max. rate at 42 bpm, average rate 39 bpm. Max. pumping pressure 10,867. Average pressure 9,000. ISIP 7,520, 5 min. 7275, 10 min. 7223, 15 min. 7173. Traced all sand with Scandium (SC-46-ZW). Good job considering temperatures of -10 degrees. Partially rigging down and moving aside Halliburton so we can get hot oilers in to heat water. Now have 13 tanks full of water with freezing problems. Will run plug and perforate tomorrow. Flowing well to pit on 8 choke. At 2400 hours pressure at 2800, water recovered for this period 840 bbls.
- 02/01/08 Completion day 33. Flowing well back to pit on 8 choke, pressure at 1800 psi. RU BWWL. RU 10 K lubricator, make up 10 K Flow Through Plug and perforating guns and RIH. Set Plug at 12, 985'. Perforated 2 SPF from **12,939' to 12,943' & 12,860' to 12,864'**. Pulled out of hole. LD setting tools, and guns. All shots fired. PU guns and RIH. Perforate **12,808' to 12,820' & from 12,667' to 12,672'**. Again all 2 SPF. POH, all shots fired. RD BWWL. Halliburton on location servicing equipment for Frac tomorrow. Filling Frac Tanks and heating same. Fluid Left To Recover: 8163 bbls. Well open on 14 choke, pressure at 1500 psi at 2400 hours. Recovered a total of 1120 bbls of fluid with 7043 bbls Left To Recover.
- 02/02/08 Completion day 34. Flowed well on 14 choke overnight. Pressure at 1000 psi. Hauled in clean city water for Frac. Two hot oilers on location heating water. Finished heating water with hot oiler. RD Hot Oilers and move out same. Moved in Stinger and stung into well head. Rig up Halliburton lines to well head. Held Safety Meeting. Pressure tested all lines, valves and manifold to 12,500 psi. Open well and loaded hole with 162 bbls of clean fresh city water. Formation broke at 8408 psi at 20 BPM. Pumped 1000 gallons of 15% Acid. Pumped a total of 3960 bbls of fluid. Pumped in a total of 60,010 # of sand. Pumped .25, .50, .75, .100, and 1.50. Max. treating pressure 9768, average treating pressure 7650. Max. rate 45 BPM, average rate 40 BPM. ISIP 6758 psi, 5 min. 6918 psi, 10 min. 6897 psi, 15 min. 6882 psi. All sand traced with Antimony, (Sb-124 ZW). Text Book Job, put away all sand at a good rate with decent pressures. RD Halliburton lines from well head, Removed stinger. RU BWWL, RU 10 K lubricator. RIH with 10 K Flow Through Plug, and perforating gun. Set Plug at 12465. Picked up 30', set back down on plug, plug in place. **Perforated from 12,375' to 12,380'.**



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Perforated with 2 SPF. Pulled out of hole, LD setting tool and gun. All shots fired. Made up 3 -6' guns and RIH. **Perforated 12,330' to 12,336', & 12,232' to 12,238', & 12,120' to 12,126'**. All shots at 2 SPF. POH, LD guns, all shots fired. Opened well on 12 choke at 2100 hours. Flowed well back to pit, pressure at 2400 hours 2800 psi. Recovered a total of 880 bbls of water. Now have a total load of fluid to recover: 10,123 bbls.

02/03/08 Completion day 35. Flow back well to pit, pressure at 2700 psi at 0600. Move in Stinger and RU on well head. RU Halliburton on well head. Held Safety Meeting with all personnel. Test all lines, manifold and valves to 12,500 psi. Pumped in 60 bbls of clean city water to fill casing. Pumped in 1000 gallons of 15% Acid. Formation broke down at 9859 psi at 15 BPM. Pumped in a total of 3810 bbls of fluid. Max. pressure at 10,215 psi., average pressure at 7,600 psi. Pumped in a total of 59,383 pounds of 30/50 PRC sand. Max. rate at 43 BPM, average rate 38 BPM. Frac Gradient 0.96. ISIP 6449 psi, 5 min. 6150 psi, 10 min. 6105 psi, 15 min. 6128 psi. Traced all sand with Scandium Sc-46 ZW. RD Stinger, RU BWWL, RU 10 K lubricator. RIH with Flow Through Plug and perforating gun. Set plug at 12000'. Picked up 30', ran in and tagged plug, plug in place. **Perforated from 11,967 to 11,972'**. Shot with 2 SPF. POH, LD setting tool and gun. All shots fired. Made up 3-5' guns and start in hole. Problems with collar locator, pulled out and laid down lubricator. Continued to have problems with BWWL. Cut 500' of cable from spool. Re-headed lubricator. Fluid Left To Recover: 13,553 bbls.

02/04/08 Completion day 36. Had problems with BWWL electric line, cut off 500' of bad wire. Re headed lubricator and picked up 3-5' guns. Re-ran same guns that did not fire on last run due to bad wire. RIH **perforated from 11,847' to 11,852' & from 11,781' to 11,786' & from 11,710' to 11,715'**. All shots 2 SPF. POH, all shots fired. RD BWWL. Flow back well to pit on 12 choke. Pressure at 3900 psi with 13,553 bbls left to recover. Move in Stinger and sting into well head. Began rigging up Halliburton. Held safety Meeting. Tested all lines, valves, manifold to 12,500 psi. Opened well and loaded casing with 63 bbls of clean fresh city water. Formation broke at 8603' psi at 16 BPM. Pumped 2673 bbls of fluid. Max. pressure 9500 psi, average pressure 6700 psi. Max. rate 37 BPM, Average rate 35 BPM. **Pumped a total of 23,539 pounds of 30/50 PRC**. Frac gradient 0.95. ISIP 6063, 5 min. 5740 psi, 10 min. 5725 psi, 15 min. 5714 psi. Pumped in 1000 gallons of 15% acid before sand. During the 0.75 ppg sand stage the blender shut down due to being OUT OF FUEL. Job was then shut down for a period of time while the pre-gel blender was set to pump. Due to the length of time we were down 290 bbls of flush was pumped without any chemicals. This Frac was scheduled to pump in a total of 60,000 pounds of sand. Very poor performance from Halliburton. Rig down Halliburton and move off location. They were committed to another Company for tomorrow. Flowing back well to pit on 14 choke.

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Pressure at 2400 hours 1600 psi. Flowed 1228 bbls during this period.  
Left to Recover: 16,226 bbls of fluid.

02/05/08 Completion day 37. Flow back well to pit. Pressure at 1200 psi on 14 choke. RU 10 K lubricator, Make up 10 K Flow Through Plug and 5' gun and RIH. Set plug at 11,650. Attempt to perforate, miss- fire. POH, LD setting tool and gun. Found short in line. Made up guns and RIH. Perforated **11,587' to 11,592' & 11,499' to 11,506' & 11,480' to 11,486', & 11,466' to 11,472'**. All shots are 2 SPF. POH, LD guns. All shots fired. RD BWWL. Open well to pit and flow back on 14/ 16 choke. Pressure at 2400 hours 2000 psi. Flowed back a total of 1480 bbls of fluid during this period. LTR: 14,746 bbls.

02/06/08 Completion day 38. Continued to flow back to pit. Pressure at 2800 psi on 16 choke. Recovered a total of 1920 bbls of fluid. Fluid mostly water with traces of gas. Gas will burn until hit with a large slug of water. LTR: 12826 bbls.

02/07/08 Completion day 39. Flow back to pit on 16 choke. Pressure at 2400 hours = 2300 psi. Recovered a total of 1460 bbls during this period. LTR: 11,366 bbls.

02/08/08 Completion day 40. Flow back to pit on 16 choke. Pressure at 2400 hours = 2200 psi. Recovered a total of 1220 bbls during this period. LTR: 10,146 bbls.

02/09/08 Completion day 41. Flow back to pit on 14 choke. Pressure at 2400 hours = 1600 psi. Recovered a total of 1180 bbls during this period. LTR: 8966 bbls.

02/10/08 Completion day 42. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 960 bbls during this period. LTR: 6956 bbls.

02/11/08 Completion day 43. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 580 bbls during this period. LTR: 6366 bbls.

02/12/08 Completion day 44. No report.

02/13/08 Completion day 45. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 460 bbls during this period. LTR: 5906 bbls.

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02/14/08 Completion day 46. Flow back to pit on 14 choke. Pressure at 2400 hours = 1800 psi. Recovered a total of 460 bbls during this period. LTR: 5446 bbls.

02/15/08 Completion day 47. Continue to flow back well. Pressure at 2400 hours 2400 psi. Flowed back a total of 320 bbls. LTR: 5126 bbls.

02/16/08 Completion day 48. Flowing well to pit. Pressure at 2400 hours 3200 psi. Flowed back a total of 20 bbls. LTR: 5106.

02/17/08 Completion day 49. Continue to flow back and flare well. Pressure at 2400 hours on 18/64 choke: 1400 psi. Flowed back 620 bbls of fluid. LTR at 0600 hours : 4486 bbls.

02/18/08 Completion day 50. Continue to flow and flare well to pit. Pressure at 2400 hours 2400 psi on 14/64 choke. Recovered a total of 250 bbls during this period. LTR: 4236 bbls.

02/19/08 Completion day 51. Continued to flow and flare well to pit on 14 choke. Moved in and rigged up Halliburton to **Frac Zone 12**. Rigged up on top of Frac Valve. Problems with Equipment being froze. Manifold had to be thawed out, full of ice plugs. Tested all lines and manifold to 9550 psi. Repaired several leaks on pump trucks. Finally got a good test. Held safety meeting prior to pumping job. Pressured up on top of Frac valve to 2800 psi. Opened valve and loaded hole with 102 bbls of clean city water. Break down at 7560 psi. Pumped 1000 gallons of 15% Acid. Pumped a total of 3363 bbls of fluid. **Pumped a total of 50,000# of 30/50 PRC sand.** Pumped 0.25#, 0.50#, 0.75#, 1.0# and 1.50#. Max. pumping pressure 8511 psi, average pumping pressure 6444 psi. Max. rate 44.8 bpm, average rate 41.1 bpm. Final ISIP 5350 psi, 5 min. 5240 psi, 10 min. 5160 psi, 15 min. 5104 psi. Frac Gradient 0.90 psi. Traced all sand with Antimony. Good job. RD Halliburton. RU BWWL and RIH with Flow through plug and 1- 8' gun. Set plug at 11410'. Picked up 30', set back down and plug in place. **Perforated from 11,228' to 11,236'.** Perforated 2 SPF. Pulled out of hole, all shots fired. RIH with guns and perforated from **11,172' to 11,180', and from 11,074' to 11,082'.** All at 2 SPF. POH, LD guns, all shots fired. RD BWWL. Open well on 22/64 choke. Pressure at 2400 hours 1400 psi. Recovered a total of 820 bbls of fluid. LTR: 6779 bbls.

02/20/08 Completion day 52. Flow back well to pit on 14/64 choke. Rig up Halliburton to **Frac Zone 13**. Held safety meeting with all hands on location. Tested all lines and manifold to 9100 psi. All tested OK. Opened well and loaded hole with 119 bbls of clean city water. Formation broke at 7049 at 15.5 bpm. Pumped a total of 3788 bbls of fluid. Max. rate 42.1 bpm, av. rate 39 bpm. Max. pressure 8032 psi, av. pressure

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6066 psi. **Pumped in formation 60,300 lb 30/50 PRC sand.** Traced all sand with Iridum. Final ISIP 4980, 5 min. 4678 psi, 10 min. 4569 psi, 15 min. 4507 psi. Good Job. RD and move out Halliburton and BWVL. Released large diesel heater. Released 15 -500 bbl Frac Tanks. Greased 10K Frac Valve. Filled up 8 frac tanks with filtered water out of the pit and will use on CO2 jobs. Open well to pit on 16 choke. Pressure at 4000 psi. Pressure at 2400 hours 2000 psi. Recovered during this period 1270 bbls. Left To Recover: 9297 bbls.

02/21/08	Completion day 53. Flow and flare well to pit. Open on 14 & 16 choke. Pressure at 2400 hours. Recovered a total of 2460 bbls during this period. Left To Recover: 6837 bbls.
02/22/08	Completion day 54. Continued to flow and flare well to pit. Well open on 14 choke. Recovered a total of 1440 bbls of fluid during this period. 5397 bbls left to recover.
02/23/08	Completion day 55. Continue to Flare and Flow well to pit. Well open on 14/64 choke. Recovered a total of 1390 bbls of fluid during this period. 4007 bbls left to recover.
02/24/08	Completion day 56. Continue to flow and flare well to pit. Pressure at 2400 hours 800 psi. Recovered a total of 630 bbls of fluid during this period. Left To Recover: 3377 bbls.
02/25/08	Completion day 57. Continue to flow and flare well on 12 & 14 choke. Pressure at 2400 hours 1400 psi. Recovered a total of 440 bbls of fluid during this time. Left To Recover: 2937 bbls.
02/26/08	Completion day 58. Continued to flow well on 12/14 choke. Pressure at 2400 hours 1200 psi. Recovered a total of 240 bbls of fluid during this period. Left To Recover: 2697 bbls.
02/27/08	Completion day 59. No report.
02/28/08	Completion day 60. Flow well to pit on 14/13 choke. Pressure at noon 1000 psi. Move in, unload and hook up test separator. Problems with barton meter and a couple of valves. Service hand due out this AM. Flow and Flare well to pit through separator. Pressure at 2400 hours 2000 psi. Recovered a total of 90 bbls of fluid during this period. Left To Recover: 2377 bbls.
02/29/08	Completion day 61. Flowing and flaring well through test separator. Continue to have problems with measurements from separator. Recovered a total of 342 bbls of fluid during this period. Left To Recover: 2035 bbls.

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- 03/01/08 Completion day 62. Flowing and Flaring well through separator on 16 choke, Pressure at 2400 hours 1000 psi. Recovered a total of 672 bbls of fluid during this period. Left to Recover: 1363 bbls. Flowing at a rate of 2040 MCF/D.
- 03/02/08 Completion day 63. Flowing and Flaring well through test Separator. BJ Coil Services arrived on location at 0900 hours. Spotted unit on wellhead and began to rig up. BJ supervisor came in trailer and advised his crane was not large enough to pick up head and their BOP's. Discussed situation and decided to pick same up with the Rig blocks. After a 2 hour wait the supervisor came in trailer and advised we did not have the proper certified sling or shackle. I informed him it was not our responsibility to provide BJ with either of these items. BJ supervisor made several calls to his office and they decided to bring out a larger crane tomorrow AM. Shut well in for a pressure build up. S. I. pressure at 2400 hours 6000 psi.
- 03/03/08 Completion day 64. Continued to flow well while waiting on BJ crane. Rigged up crane and rigged up coil unit. Very slow rigging up. Attempted to test BJ preventers. While trying to test crane operator picked up on stack breaking down test. Pressured up to 2000 psi. Will test to 7500 psi. Shut down for night. SI pressure at 2400 hours: 6400 psi.
- 03/04/08 Completion day 65. Well shut in waiting on coil crew. Pressure at 2400 hours: 6400 psi. Finished rigging up BJ coil. Tested BOP's and all lines to 7000 psi, OK. RIH with 4 1/2" 5 blade mill, motor assembly & motor on 1 3/4" coil tubing. Didn't see plug that was supposed to be at 11,410'. RI & drill up plugs at 11,650', 12,000' & 12,465'. Stripper rubber leaking bad. Circ clean. Pull coil up hole with bit at 10,998' - above top perforations. Pump 50 bbl 10 ppg brine water down coil and work on stripper rubber. Rubber is frozen in sleeve. SDFN @ 7:00 pm.
- 03/05/08 Completion day 66. Well SI - SICP 3800 psi. Open well to pit to blow down pressure, pump warm water down tbg. Tbg slips frozen - open tbg slips. RIH with coil from 10,998' to 5th plug @ 12,985'. Drill on plug - motor stalled. PU 6 ft and pulled tight. Run back in to 12,981', set down - stuck pulling 42K - 13 times. Pump 500 cfm N2 with 1-3/4 bpm water - circ light fluid to surface. Cut N2 to 350 cfm, pulling up to 47K - 4 times. 5th time cut all fluids and pulled up to 47K. Pulled free. Pulled up to 12,728'. SD to try to change stripping rubber. Still unable to pull rubber - appears to be frozen in sleeve. RIH, drilled plugs 5 & 6. Had sand bridges at 13,413', 13,555', 16,638' (20' bridge), and 13,730'. Washed thru sand bridges. Tagged plug 7 @ 14,035', plug moving down hole to 14,400'. Started drilling on plugs, chokes plugged off. Pull up hole, circ. Cleared chokes. Pulled up to 10,993'. Circulating @ 2 1/2 bpm. Circ hole clean. Pumped 50 bbl 10# brine water down coil. Closed BOP and SI csg. valve. SDFN @ 10:00 pm.

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- 03/06/08 Completion day 67. Well SI. SICP 4000 psi. Opened Well to pit - pressure down to 1400 psi within 5 min. BJ attempted again to change stripper rubber - leaking bad. Can't get window open - frozen. POH with tbg, motor and mill. Remove coil gooseneck with crane and set off. Thaw and replace stripper rubber. Disconnect tools - motor and mill have to be replaced. MU new 4 1/2" 5 blade mill, motor, and hyd., disconnect, jars, 2-7/8" motor head assemble. Connect tools and PT. Would not test. Had a hole in tubing above tools. Disconnect tools, cut off about 30' of crimped tubing, reconnect tools and PT. Transferred Coil from crane to rig. MU coil unit. RIH to 10,800'. Pumped 50 bbl 10# brine down tbg. SDFN @ 8:30 pm.
- 03/07/08 Completion day 68. Well SI. SICP 4600 psi. Open well on 32 choke. Start in hole, circ @ 2 1/2 bpm. Drill up plug 8 @ 14,400', plug 9 @ 14,615', plug 10 @ 14,960' and plug 11 @ 15,350'. RIH to PBTD @ 15,434'. Pumped 10 bbl sweep and circulated for 1/2 hr. POH, Circulating coming out. Hole clean. Disconnect from well head, LD Weatherford tools, blow coil dry. RD BJ Coil Tubing Unit and Crane. SDFN @ 11:00 pm.
- 03/08/08 Completion day 69. Well SI. Black Warrior Wireline on location @ 6:30 am. SICP 5400 psi. Open well on 32 choke & blow pressure down to 2400 while RU wireline. PU Weatherford 10K CBP & Setting Sleeve. Could not get top or bottom frac valves open all the way. Heating and working valves. Blew well pressure down to 400 psi and pumped methanol into valve while working valve. Finally got bottom valve fully open but lacked 2 turns of fully opening top frac valve. Worked wireline and was able to get BP thru valves. RIH and set Weatherford Composite Bridge Plug at 10,000'. POH with setting tool and RD wireline. Pressure down to 300 psi - started pumping water down casing. CP 1800 psi. Open to well on 16 choke; pressure down to 1400 psi - opened to 18 choke. Pressure down to 1000 psi - opened to 22 choke. Pressure down to 500 psi - opened to 28 choke. Pressure down to 400 psi - opened to 32 choke. Pressure down to 300 psi closed choke & pumped 150 bbl water down casing. Unbolt frac valve at Tbg. Head. PU frac valves and visually inspect the inside of the tubing head for any damage from sand - tbg head OK. MU frac valve on tbg head. Valves closed. SDFN @ 9:00 pm.
- 03/09/08 Completion day 70. Well SI. SICP 1800 psi, bled off pressure. Remove and load out 2 frac valves and spool. NU 10K BOP's. RU Mountain States Pressure Service snubbing unit. PU stand of DC. Break & LD collars. Number and tally tubing and rabbit tubing as the stands were picked up to run. Ran 4 1/2" bit (.33'), X-Over (.80'), Float Sub (.88'), POBS (1.24'), 1 jt 2 7/8" 6.5#, P-110 tbg (32.64'), XN Nipple (.88'), 1 jt. 2 7/8" 6.5#, P-110 tbg (32.78'), X nipple (.73'). RIH with 65 stands

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(4249.57') 2 7/8" 6.5#, P-110 tubing. Bit @ 4322'. Tbg and Csg are full of water. Installed TIW valve in tbg, Closed Csg valve and Closed BOP. Drained pump & lines. Well secure - SDFN @ 7:00 pm.

- 03/10/08 Completion day 71. Well shut in waiting on daylight. Snub in hole with 2 7/8" P-110 tubing to 10,058'. Tag Plug at 10,058'. Repairs to power swivel. Rig up power swivel and drill out plug at 10,058'. Pressure immediately went to 4600 psi after drilling plug. Bled down pressure to 2600 psi and continued in hole with tubing. Current depth is 11,691'. Secured well for night. Installed TIW valve and SDFN. Flowing well during night to keep pressure down while snubbing in hole to land tubing.
- 03/11/08 Completion day 72. Flow and Flare well to pit during night. Bleeding down pressure from 3400 psi to 1200 psi. Flowing on 40/32 choke. Recovered a total of 1600 bbls of water during this period. Continued to snub in hole with Mountain States Snubbing Services. Ran in hole with 474 joints of 2 7/8" P-110 tubing. Cleaned out to 15,404'. Have 1 damaged joint of tubing left on location. Picked up and laid down 9 joints of tubing. Made up hanger and landed same. E.O.T. at 15,075'. Pressure at 1500 to 2000psi while running in with tubing. Tighten lock in screws on tubing hanger. Rig Down Snubbing unit. Nipple Down BOP's, Nipple up 7 1/16" X 10 k upper tree. Test same to 10000 psi, ok. Attempting to pump off sub and bit. Key Well Service would not maintain any steady pressure due to seats and liners leaking. Finally got pressure to 3200 psi and it appeared sub was pumped off. Rigging down rig. Will release Key rig and move off location tomorrow. Released the following equipment today: Fork Lift, BOP's, Drill Collars, Washington Head, and all handling tools from Weatherford. Bit and pump off sub pumped off. Flowing back through tubing, well flowing on a 24 choke, recovered a total of 2200 bbls of water during this period. Pressure at 400 psi.
- 03/12/08 Completion day 73. Flow back well through tubing. Flowing on 24 choke. Pressure at 400 psi with well unloading water. 1000 psi on casing. Loading out rental tools. Released BOP's, Accumulator, Flanges, 4- drill collars, and all rental subs. Loaded out truck with rental fork lift. **Rig Released at 0900, 3-12-08.** Rig up PLS logging services and ran in hole with Protechnics tracer log. Logged from 15430' to 10700'. Results of log will be sent in to Greg Olson. SICP 3200 psi, SITP 2000 psi. Started bleeding down well to put in separator. At 2400 hours Flowing tubing pressure 1000 psi, casing pressure 1700 psi. Flowing well on 18/64 choke. Flowed a total of 1240 bbls of fluid during this period.
- 03/13/08 Completion day 74. Continued to flow and flare well through separator. Waiting on Natco to line out test separator. Flaring through separator while Natco adjusts charts and orifice plates on separator. Flaring well through test separator. Pressure on tubing at 2400 hours 1200 psi,

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casing 1800 psi. Flowed a total of 375 bbls of fluid during this period. Flowing at a rate of 2036 MCF/d. Cleaned up and bladed location.

- 03/14/08 Completion day 75. Testing well through test separator. Continue to flow well through test separator. Flowing well on 18 choke. Pressure at 1100 psi on tubing, pressure on casing 1700 psi. Well flowing at a rate of 1908 MCF/D.
- 03/15/08 Completion day 76. Continued to flow well through test separator. Flowing tubing pressure 1000 psi, SICP 1700 psi. Flowing well on 18 choke. Made a total of 225 bbls of fluid during this period. Yesterday well flowed a total of 301 bbls of fluid. I failed to include this on the report. Flowing at a rate of 1950 MCF/D
- 03/16/08 Completion day 77. Continued to flow well through test separator. Flowing tubing pressure 1000 psi, SICP 1600 psi. Recovered a total of 218 bbls of fluid. Flowing at a rate of 1950 MCF/d.
- 03/17/08 Completion day 78. Flowing well through test separator. Pressure on tubing 1000 psi, SICP 1600. Flowing at a rate of 1950 MCF/d. Well shut in while moving separator away from well head. Could not move it until now due to Key Well Services pump and tank in the way. Setting up flare stack along with rigging up separator. Flowing well to pit while waiting on daylight to finish hooking up flare stack and separator. Flowing tubing pressure 800 psi, SICP 1400 psi.
- 03/18/08 Completion day 79. Completed hook up on flare stack and separator. Testing well through separator. Flowing tubing pressure at 2400 hours 1000 psi. SICP 1600 psi. Recovered a total of 135 bbls of fluid during this period. At 2400 hours flowing at a rate of 1031 MCF/d on 18 choke.
- 03/19/08 Completion day 80. Continue to test well through separator on 18 choke. Flowed back a total of 199 bbls of fluid during this period. At 2400 hours flowing tubing pressure 800 psi, SICP 1400 psi. 912 MCF/dd
- 03/20/08 Completion day 81. Continued to flow test well through separator. Flowing tubing pressure 800 psi. SICP 1400 psi. Flowed back a total of 192 bbls of fluid during this period. 912 MCF/d
- 03/21/08 Completion day 82. Continued to test well through test separator. Flowing tubing pressure 800 psi, SICP 1400 psi. Recovered a total of 195 bbls of fluid during this period. 912 MCF/d



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03/22/08	Completion day 83. Continued to test well through test separator. Flowing tubing pressure at 800 psi, SICP 1400 psi. Flowed back a total of 195 bbls of fluid during this period. 949 MCF/d
03/23/08	Completion day 84. Continued to test well through test separator. Flowing tubing pressure 800 psi, SICP 1400 psi. Recovered a total of 186 bbls of fluid during this period. 1026 MCF/d
03/24/08	Completion day 85. Continue to test well on 18 choke through test separator. Flowing tubing pressure 800 psi, SITP 1300 psi. Recovered a total of 182 bbls of fluid during this period. 1071 MCF/d.
03/25/08	Completion day 86. Continue to test well. Flowed back a total of 179 bbls of water during this period. Flowing tubing pressure 800 psi, SICP 1300 psi. 1117 MCF/d
03/26/08	Completion day 87. Flow test well through test separator. Flowing tubing pressure 800 psi, SICP 1300 psi. Flowed back a total of 187 bbls of fluid during this period. 1064 MCF/d
03/27/08	Completion day 88. Continued to test well through separator. Visually, well appears to be making more gas and water than the separator meters are showing. Ordered out a new calibrated meter for replacement and old meter was not correctly measuring gas. At 1400 hours after the meter was changed the correct reading is 1733 MCF/d. At 2400 hours 1854 MCF/d, on 18 choke. Flowing tubing pressure 800 psi, SICP 1300 psi. 187 water during this period.
03/28/08	Completion day 89. No report.
03/29/08	Completion day 90. Continue to test well through separator. Flowing tubing pressure 750 psi, SICP 1250 psi. Recovered a total of 151 bbls of fluid during this period. Resistivity 550, 1854 MCF/d.
03/30/08	Completion day 91. Continue to test well. Flowing tubing pressure at 2400 hours 700 psi, SICP 1300 psi. Recovered a total of 140 bbls of fluid during this period. At 2400 hours rate at 1677 MCF/d. Low tubing pressure at 1800 hours 650 psi. Low casing pressure at 1800 hours 1250 psi. Rate at 1900 hours 1565 MCF/d. Resistivity: 1500
03/31/08	Completion day 92. Continue to test well on 18 choke. Flowing tubing pressure 750 psi, SICP 1250 psi. Recovered a total of 156 bbls of fluid during this period. 1564 MCF/d

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04/01/08	Completion day 93. Continued to flow well on 18 choke. Flowing tubing pressure 700 psi, SICP 12550 psi. Recovered a total of 136 bbls of fluid during this period. 1416 MCF/d
04/02/08	Completion day 94. Continue to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 135 bbls of fluid during this period. 1551 MCF/d
04/03/08	Completion day 95. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 155 bbls of fluid during this period. 1483 MCF/d
04/04/08	Completion day 96. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 127 bbls of fluid during this period. 1369 MCF/d, resistivity 1200
04/05/08	Completion day 97. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1250 psi. Recovered a total of 141 bbls of fluid during this period. 1342 MCF/d, Resistivity: 1400
04/06/08	Completion day 98. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 132 bbls of fluid during this period. 1445 MCF/d, Resistivity: 1200
04/07/08	Completion day 99. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 118 bbls of fluid during this period. 1396 MCF/d, Resistivity: 1500
04/08/08	Completion day 100. Continue to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 110 bbls of fluid during this period. 1396 MCF/d, Resistivity: 1500
04/09/08	Completion day 101. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 116 bbls of fluid during this period. 1396 MCF/d, Resistivity: 1400
04/10/08	Completion day 102. Continued to test well on 18 choke. Flowing tubing pressure 700 psi. SICP 1200 psi. Recovered a total of 94 bbls of fluid during this period. 1473 MCF/d, Resistivity: 1500
04/11/08	Completion day 103. Continued to Test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 94 bbls of fluid during this period. 1304 MCF/d, Resistivity: 1600
04/12/08	Completion day 104. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 97 bbls of fluid during this period. 1304 MCF/d, Resistivity: 1500

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04/13/08 Completion day 105. Continue to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200. Recovered a total of 119 bbls of fluid during this period. 1304 MCF/d, Resistivity: 1500

04/14/08 Completion day 106. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 92 bbls during this period. 1304 MCF/d, Resistivity: 1500

04/15/08 Completion day 107. Continued to test well on 18 choke. Flowing tubing pressure 700 psi, SICP 1200 psi. Recovered a total of 69 bbls of fluid during this period. 1304 MCF/d

04/16/08 Completion day 108. Continued to test well on 18 choke. Flowing tubing pressure dropped to 650 psi and SICP dropped to 1100 psi. Recovered a total of 77 bbls of fluid during this period. 1192 MCF/d, Resistivity: 1800

04/17/08 Completion day 109. Continue to test well on 18 choke. Flowing tubing pressure 600 psi, SICP 1100 psi. Recovered a total of 98 bbls of fluid during this period. 1266 MCF/d

04/18/08 Completion day 110. Continue to test well on 18 choke. Flowing tubing pressure 600 psi, SICP 1100 psi. Recovered a total of 28 bbls of fluid during this period. 1192 MCF/d. Shut well in at 1200 noon. Rig due in today but has been delayed until Monday. Rigged down Premier Flow Back Services and released same. Released at 1700 hours on 4-18-08. Rigged up bleed down line from well head to pit through manifold. Separator and flare stack still rigged up. SITP 2600 psi, SICP 2900 psi.

04/19/08 Completion day 111. Well shut in waiting on Rig. SICP 5000 psi, SITP 5000 psi. 5000 psi gauges on tree. Will install 10000 psi gauges

04/20/08 Completion day 112. Waiting on Rig. Well Shut In. 5000 psi gauges maxed out at 5000 psi on both tubing and casing. Will change out today.

04/21/08 Completion day 113. Move in Excel Services Rig and Rig up. Changed 5000 psi gauges to 10000 psi gauges. SICP; 5600 psi, SITP 5600 psi. Rig up Lubricator and run BPV. Bleed down pressure. BPV holding. ND Tree. Install 10 K Frac valve. Break down and install bottom valve from tree on top of Frac Valve as a safety precaution. Pull BPV. Frac Valve leaking. SDFN. Will replace Frac valve tomorrow.

04/22/08 Completion day 114. Waiting on Frac Valve. SICP 5600 psi and SITP, 5600 psi. Rigged up Lubricator and set BPV. BPV held okay. Removed leaking Frac Valve. Installed new Frac valve. Pulled BPV and checked same. Attempt to re-run BPV before installing flange and BOP's. Unable to make up BPV due to freezing in well head. Pumped in Methanol and waited 1 hour. Unable to get BPV in to hanger. Rig up pump and tank. Ordered out hot oiler for tomorrow AM. Will attempt to thaw out well head. Shut down for night

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04/23/08 Completion day 115. Wait on daylight. Well shut in. SITP & SICP 6000 psi. Hook up hot oiler and thaw out well head. Install BPV. RD lubricator. Install Flange on Frac valve and NU BOP's. RU Mountain States Snubbing services. Bleed down well pressure from 6000 psi to 3000 psi on 18 choke. Flowing back dry gas with no water. Pump 50 bbls water down tubing to top kill well. POH w/ Snubbing unit 65 jts of 2-7/8" tubing, laying down. Tubing stands too tall to pull. Well shut-in. ISIP on casing 1400 psi.

04/24/08 Completion day 116. Wait on Daylight. Flowing well. SICP 4400 psi @ 5:00 w/ 12 choke. SICP 3300 psi @ 6:00 w/ 15 choke. SICP 2800 psi @ 7:00 w/ 18 choke. Pump 50 bbls water to top kill tubing. POH with Snubbing unit 94 jts (156 total). EOT approximately 10005 ft. Estimate 45-50 Bbls water recovered to pit during snubbing operations. Wait on Wireline truck to run production logs. Flowback well overnight. Recovered 39 Bbls of water by 24:00.

04/25/08 Completion day 117. Flowback well to relieve pressure and remove water for wireline production logs. Recovered 45 Bbls water in 7 hrs. Casing Pressure 900 psi. Wait on wireline logs. Maintain well flowing back on 14 choke. R/U and run wireline production logs. R/D Production logging equipment and attempt to set 2-7/8" tubing plug in x/n nipple.

04/26/08 Completion day 118. Attempt to set tubing plug. Main pulley on wireline truck seized. POH w/ wireline and wait on replacement pulley. Wait on replacement pulley for wireline truck. Attempt to set tubing plug in x/n nipple. Set tubing plug in x nipple. R/D wireline truck. Shut in well, WOD. Shut in well.

04/27/08 Completion day 119. Wait on Daylight. SICP 3400 psi. Opened gradually to 14 choke. R/U catwalk and pipe racks. Safety Meeting. POH 318 jts w/ Snubbing unit. R/D Snubbing unit. SICP 600 psi. Shut in well and wait for daylight.

04/28/08 Completion day 120. Wait on Daylight. RU Black Warrior W.L. Install Lubricator. Make up and RIH to 60' with Gauge Ring and Junk Basket. Pulled out of hole. Junk Basket full of sand. Lay down ring and basket. Made up 5 1/2" Composite Bridge Plug and start in hole. At 9800' tagged fill. Worked through same and ran in to the collar below 11040'. Tools appear to be sticky. Attempted to set plug at 11,040'. Plug appeared to set. Pull up 100', again very sticky. Ran in to 11,040 and set down on what was thought to be the plug. Bled down well. Well bled down to 0 pressure but had a slight blow. Started out of the hole. At 3000' had no line weight. Indications were the line had pulled out of the rope socket. Well continued to have slight blow. Finished out of the hole and line had parted. Did not pull out of the rope socket but had parted leaving in hole cable head, 2-7' weight bars, CCL, and setting tool. Well immediately began to blow and unloaded the hole. Blew out all of the tools left in hole plus approximately 25' of wire. Shut in blind rams and secured well. No injuries, no fluid touched the ground. Rigged down Wire Line. Inspected rig for damage. Found 2 girts in the derrick damaged. Laid down derrick for further inspection. Ordered out Certified derrick inspector to check out same. Inspector arrived and said repairs could be done on location in 2 to 3 days. Well Shut in and secure.

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04/29/08 Completion day 121. Well Shut in. Wait on coiled tubing unit. Repairs to derrick. Changing out 2 girls and cross members in derrick. SICP 3000 psi. Well shut in.

04/30/08 Completion day 122. Well shut in. SICP 4600 psi. Waiting on Coil Unit to clean out to TD.

05/01/08 Completion day 123. Shut in for night. SICP 5100 psi. Halliburton Coil Tubing Unit arrived on location. Spotted Coil equipment to well head and rigged up. Wait on daylight

05/02/08 Completion day 124. Shut in for night. SICP 5100 psi. Bleed down casing while finish rigging up coil unit. Make up Weatherford motor and 4 1/2" drag bit. HELD SAFETY MEETING. Filled coil with clean fresh water from storage tanks on location. Tested tools to coil to 25K, pressure test to 2500, function test 1.5 BPM/2000 psi. RIH with coil to 15,402. Circulating out slight traces of sand. Recovered several small pieces of rubber and metal from Wire Line tools. Pump Rate 2 BPM while running in hole. Pumped 19 bbls pill on bottom and circulated out same. Start out of hole with Coil. RD Halliburton Coil Unit and released same. Shut down for night.

05/03/08 Completion day 125. Wait on Daylight. Move in and rig up BWWL. Install lubricator with crane. Make up Gauge ring and junk basket. Attempt to RIH with same. Could not get past well head due to a ice plug from flowing the well back. Unable to locate hot oiler. Sent crew home until Monday. Will rig up tarp and heater to thaw out well head. Well shut in with heater and tarp thawing out well head.

05/04/08 Completion day 126. Thawing out well head.

05/05/08 Completion day 127. SDFN. Loaded 2 Mountain Movers with sand. Preparing to Frac in the AM. Wait on Daylight. Move in and rig up BWWL. Make up 5 1/2" Solid composite plug and run in hole. Tagged a soft fill at 945'. Worked in hole slowly to 12500'. Correlated to Densilog/Neutronlog. Set plug at 11,040'. Picked up 100' and Ran in and tagged solid at top of plug at 11,040'. Pulled out of hole with setting tool. Laid down lubricator. ND BOP's. Remove leaking Frac Valve and replace with newly tested Frac Plug. Pick up lubricator and RIH with a 11"-- 4" casing gun, 120 degree phasing, 23.5 gm, .43 dia. (35" penetration). **Perforated from 10,932' to 10,943'** with 2 SPF. Pull out of hole, all shots fired. RD BWWL.

05/06/08 Completion day 128. Wait on daylight. SICP after perforating: 1000 psi. Move in Halliburton and rig up to Frac. Frac is a 70% Co2 frac Gradient 0.87. Frac with 20/40 tempered Sand. Held safety meeting. Pressure tested all ines to 10000 psi, ok. Loaded hole and broke formation down with 9.4 bbp at 6602 psi. Pumped in formation 89000 lbs 20/40 sand with 214 tons of Co2 pumped downhole. ISIP 4697, 5 Min 4519 psi, 10 min. 4450 psi, 15 min. 4398 psi. Maximum pumping rate 31.8 bpm. Pumped in a total of 950 bbls of fluid. Traced all sand with Scandium. RU BWWL. Make up Flow through plug and 1 perforating gun and prepare to RIH. Found short in line. Wait on repair kit from

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town. Repair short and RIH. Set Flow Through Plug at 10,860'. Pick up 100' and run in and tag solid plug. **Perforate from 10,777' to 10,781' and from 10,827' to 10,834'**. Perforated 2 SPF, 120 degree phasing, with 4" casing gun. 23.5 gm, .43" dia. Pulled out of hole. All shots fired. Laid down gun and pick up loaded gun. RIH and **perforated from 10,682' to 10,698' and from 10,738' to 10,748'**. Pulled out of hole and all shots had fired. Rigged down BWWL. Wait on Daylight.

- 05/07/08 Completion day 129. Wait on Daylight. SICP 3800 psi. Safety Meeting, test all lines to 10000 psi, ok. Open well. Hole full. Break down formation at 5382 psi at 9 BPM. Frac with 70% Co2 Foam. Pumped in a total of 150,200 lbs 20/40 tempered sand. Traced all sand with Antimony. Pumped at a rate of 30.6 bpm, max. rate 34.8 bpm. Max. pressure while pumping 5837 psi. Frac Gradient 0.88, ISIP 4747 psi, 5 min. 4403 psi, 10 min. 4245 psi, 15 min. 4146 psi. RD Halliburton. Well shut in while waiting on Halliburton to move out. Well shut in with 3800 psi. Opened well on 14 choke. Flowing water, Co2 with slight traces of sand. Pressure at 1700 hours 2400 psi. Opened well up to a 18 choke. At 2400 hours pressure at 1400 psi. Well flowing water, with slight traces of Co2. Recovered a total of 260 bbls of fluid.
- 05/08/08 Completion day 130. Flowing back Co2 and water with foam. Flowing on 18 choke. Received orders from Denver to continue flowing well until Monday. Called Halliburton, Black Warrior W.L., Protechnics, and Praxair and cancelled them until Monday. Flowing well to pit on 18 choke. Recovering frac water with slight traces of Co2. Recovered a total of 612 bbls of fluid. Left to recover 874 bbls.
- 05/09/08 Completion day 131. Continue to flow back well on 18 choke. Pressure at 800 psi. Recovered a total of 557 bbls of fluid. Attempted to burn every 3 to b4 hours but would not burn. Still recovering traces of Co2 and water. LTR: 317 bbls.
- 05/10/08 Completion day 132. Continued to flow well on 18 choke. Pressure at 600 psi and dropping. Continue to recover traces of Co2. Attempt to light flow back every 6 hours but would not burn. Recovered a total of 245 bbls of fluid. LTR: 72 bbls.
- 05/11/08 Completion day 133. Flowing well on 18 & 28 choke. Pressure at 300 psi. Recovered a total of 162 bbls of fluid. Fluid will not burn. Recovered a total of 90 bbls over Frac load.
- 05/12/08 Completion day 134. Continue to flow well on 18 choke. Pressure at 300 psi. Recovered a total of 90 bbls of fluid over frac load. Fluid will not burn. Move in and RU BWWL. Ran in hole and set Flow through Frac Plug at 10,640'. Pick up 100' and run in and tag solid plug at 10,640'. **Perforate from 10,574' to 10,586' (12')**. Shot 2 SPF with 4" casing gun. Pull out of hole. All shots fired. Pick up and RIH with guns and **perforate from 10,522' to 10,528' and from 10,471' to 10,478'**. Shot 2 SPF with 4" casing gun. POOH, all shots fired. Move in and RU Halliburton to Frac. Held Safety meeting. Tested all lines to 10000 psi - OK. SICP 2100 psi, equalized and opened Frac valve. Filled hole with 40 bbls of fluid. Broke down formation with 5014 psi at 11 BPM. Frac with 70% Co2 Foam.

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Pumped a total of 121,100 lbs of 20/40 tempered sand. Average pumping rate 24.6 bpm. Pumped a total of 170 tons of Co2. Pumped a total of 835 bbls of fluid down hole. Frac Gradient 0.81 psi/ft, ISIP 3805 psi, 5 min. 3706, 10 min. 3647 psi, 15 min. 3607 psi. Traced all sand with Iridium. Good Job. RD and released Halliburton. Opened well on 14 choke. SICP 3800 psi. Flowing back Co2 and Frac water. Recovered a total of 674 bbls at 0600 hours. Pressure at 1800 psi. Left To recover: 164 bbls.

- 05/13/08 Completion day 135. Continue to flow back well on 14 choke. Pressure at 1600 psi. Recovered a total of 470 bbls of fluid during this period. Fluid will not burn. Traces of Co2 with water. Recovered a total of 1144 bbls from this Zone with 305 bbls over Frac load.
- 05/14/08 Completion day 136. Continued to flow back well on 14 choke. Pressure at 1300 psi. Recovered a total of 307 bbls of fluid during this period. Have recovered a total of 1451 bbls from this Zone. Initially pumped in 839 bbls for this zone and Co2 is 10%+. Fluid will not burn.
- 05/15/08 Completion day 137. Continued to flow back well on 14 choke. Pressure at 1200 psi and holding steady. Recovered a total of 282 bbls of fluid during this period. Fluid rate decreasing each 24 hour period. Recovered a total of 1733 bbls of fluid, Co2 rate at 7% at 12 noon and 6.5% at 1800 hours.
- 05/16/08 Completion day 138. Continue to flow back well on 14 choke. Pressure at 1200 psi and holding steady. Recovered a total of 228 bbls of fluid during this period. Fluid continues to decrease daily. Have recovered a total 1961 bbls since last Frac. Fluid will not burn. Still strong smell of Co2. Co2 5%. Gas sample taken and sent to town.
- 05/17/08 Completion day 139. Continue to flow back well on 14 choke. Pressure holding steady at 1200 psi. Flowed back a total of 170 bbls during this period. Again, fluid decreasing each day. Recovered a total of 2131 bbls since last Frac. Co2 level at 7% at 0700 and 9% at 1200 hours and 9% at 2100 hours.
- 05/18/08 Completion day 140. Continued to flow well back on a 14 choke. Pressure at 1100 psi. Recovered a total of 159 bbls of fluid during this period. Averaging 6.6 bbls per hour. Fluid recovery continues to drop each 24 hours. Co2 10% at 0700, 9% at 1400 hours and 9% at 2200 hours. Recovered a total of 2290 bbls since last Frac.
- 05/19/08 Completion day 141. Continued to flow well back on 14 choke. Pressure at 1000 psi. Recovered a total of 169 bbls of fluid during this period. Recovered a total of 2459 bbls since last Frac. Co2 at 0700 8%, Co2 at 1200 noon 8%, Co2 at 1500 hours 7%, Co2 at 2000 hours and 7%. Fluid will not burn.
- 05/20/08 Completion day 142. Continued to flow well on 14 choke. Pressure at 1000 psi. Recovered a total of 149 bbls of fluid during this period. Recovered a total of 2608 bbls of fluid since the last Frac. Co2 at 7% at 0700 hours. Co2 at noon 5.5%, same at 1700 hours. Released and hauled off location 10 rental Frac Tanks.

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05/21/08 Completion day 143. No report.

05/22/08 Completion day 144. Well continues to flow back on 36 choke. Recovered a total of 730 bbls during this period. Recovered a total of 4121 bbls of fluid since last Frac. Co2 at 0700 = 6%, At noon = 6.5%, at 1900 = 7% and Resistivity: 1600.

05/23/08 Completion day 145. Continued to flow well on 36 & 48 choke. Pressure holding at 225 psi. Rig up rig floor, set in and hook up tongs and slips. Install 5 K Annular. Hook up lines from rig pump to kill line. Fill Rig tank with 175 bbls of water from Frac Tank. Move 2 7/8" tubing from behind location to pipe racks. Measure and rabbit same. Rig Repairs, working on Hydraulics. Pumped in 100 bbls of clean fresh water to kill well. Pressure at 0 psi. Well open with 0 pressure.

05/24/08 Completion day 146. No report.

05/25/08 Completion day 147. Well open to pit. Pressure at 100 psi. Recovered a total of 370 bbls of fluid during this period. Pump 60 bbls of fluid down tubing and 100 bbls of fluid down casing to kill well. RIH with 237 joints of tubing and well began flowing up tubing. Pump 60 bbls down tubing and 80 bbls down casing. RIH with 327 joints of tubing and tag Flow Through Plug at 10,640'. Kill well with 80 bbls of fluid. Pull up above top perforation at 10,471'. Install TIW Valve on tubing. Open well up to pit for night. Spot in Power Swivel and SDFN. Well open to pit. Flowing back water and gas.

05/26/08 Completion day 148. Well open to pit, 100 psi on open choke. Flowed back 290 bbls of fluid. Kill well with 100 bbls of fluid, remove TIW. Well on vacuum. RIH and tagged plug at 10,640'. No fill on perms above plug. Drill plug, tagged solid fill from 10,700' to 10,800'. Appears all of these perms were sanded off. Drill Plug at 10,860'. RIH to 11,000'. No fill. Circulate hole clean. Strong blow on casing. Lay down power swivel. Pull out of hole with 25 stands. EOT at 9300'. Install TIW valve and SDFN. Shut well in and pressure went to 1800 psi in 15 minutes. Open well to pit and pressure decreased to 200 psi at 2400 hours. Recovered a total of 470 bbls of fluid.

05/27/08 Completion day 149. Well open to pit. Pressure on casing 200 psi. Recovered a total of 470 bbls of fluid during this period. Killed well with 100 bbls of fluid and pulled out of hole with 140 stands of tubing. Well began flowing up tubing. Killed well with 100 bbls of fluid. Pulled out of hole with 160 stands of tubing. Well flowing. Chained down tubing to BOP's, killed well with 100 bbls of fluid. Pumping fluid down tubing through TIW valve. Pulled out of hole and laid down bit. Made up Halliburton Packer and Plug and started in hole with 32 stands in hole, well flowing. Killed well with 100 bbls of fluid and RIH with 65 stands. Well flowing. Installed TIW valve and SDFN. Well open to pit. Recovered a total of 240 bbls of fluid. Pressure at 200 psi.



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05/28/08 Completion day 150. Well open to pit. Recovered a total of 240 bbls of fluid. Pressure at 200 psi. Kill well with 120 bbls of fluid. Ran In Hole with 2 7/8' tubing. Killed well with 100 bbls of fluid and 75 bbls of fluid while running in hole. Well flows back through tubing and up casing. Set packer at 10,825'. Set packer with 12,000#. RU lubricator to swab down tubing. While rigging up to swab well began flowing up tubing. Flowed a total of 57 bbls of fluid. After 57 bbls of fluid well began flowing solid gas with traces of water. Hooked up well to flow back through manifold and flow back tank in order to record pressure and to measure water. Pressure increased to 400 psi. Flow checking well on 14 choke. Pressure built to 400 psi. Flow back rate is 4.8 bbls per hour.

05/29/08 Completion day 151. Well on 14 choke until 0700. Flowed back a total of 73 bbls in 15 hours. Flowed back at a rate of 116 bbls per day. Pressure at 400 psi. Water and gas samples caught at 0700 hours. Both will be sent to town for analysis. Opened casing and began bleeding down pressure. Pressure at 1750 psi. Pressure staying at 500 psi. Opened tubing to a 48 choke and pressure bled to 100 psi. Flowing gas with traces of water. Put well back on 14 choke to record pressure and to measure water flow. Pressure back up to 380 psi in 1 hour. Well open on 14 choke. Pressure at 380 psi. Recovered a total of 46 bbls of fluid during this period. Averaging about 2 bbls per hour. Steady gas flow during this period. Estimate 250 to 300 MCF.

05/30/08 Completion day 152. At 2400 hours opened well to 48 choke. Well pressure bleed from 380 psi to 100 psi. Recovered a total of 14 bbls of water during this period. Average of 2.3 bbls of fluid for this flow period. Continued to flow gas at a rate of approx. 100 MCF. Casing pressure at 2600 psi. Opened casing to pit and began bleeding off pressure. Pressure bled down to 300 psi. Rigged up and killed well with 100 bbls of fluid. Set Plug at 10,899'. Pulled up and LD 1 joint of tubing. Set Packer and tested plug to 1000 psi. Held solid. Released pressure and pulled up and set packer at 10,665'. Will test zone 2 with perforations at 10,682' to 698', 10,738' to 10,748', 10,777' to 10,781', 10,827', to 10,834'. RU Swab lubricator. Pick up mandrel and swab cups. RIH and tag fluid at surface. Well began flowing. Flowing well back to rig tank. Well flowed back 158 bbls of fluid during this period. Flowing back on 24 choke. Pressure at 300 psi, casing at 400 psi.

05/31/08 Completion day 153. Continued to flow well on 24 choke. Flowing well to flow back tank. Flowed back a total of 183 bbls of fluid during this period. Pressure at 240 psi, well flowing back approximately 300 MCF per day.

06/01/08 Completion day 154. Flowing back well to pit on open choke. Flowed back 148 bbls during this period. Average of 6.1 bbls p/h. Casing pressure at 2400 psi, Co2 = 3%, and Resistivity at 1500. Flowing back gas at a rate of approximately 300 MCF p/d. Tubing pressure at 40 psi.

06/02/08 Completion day 155. Continue to flow well to tank on open choke. Recovered a total of 24 bbls of fluid during this period. Continues to make approximately 300 MCF p/d with 0 psi on tubing, 2600 psi on casing. Bleed down pressure on casing and prepare to move up and test zone 3. Pump 50 bbls of fluid down tubing and casing. Unseat packer, Run in and attempt to latch onto plug. Could

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not get latched up due to sand. RU and circulate sand out of hole. Latched on to plug and attempted to set several times at 10,638'. Finally set and tested to 1000 psi - OK. Pulled up and set packer at 10,439'. RU to Swab. Installed new head on lubricator that was damaged. RIH with swab and tag fluid at 2100'. Pull from 3100' and recovered 6 bbls of fluid. Well open to flow back tank. SDFN.

- 06/03/08 Completion day 156. Well open to flow back tank. At 0200 well began flowing up tubing. Flowed a total of 100 bbls. Tubing pressure at 40 psi. Continued to flow well up tubing to flow back tank. Pressure began dropping along with flow back water. Not enough pressure to unload water with 2 7/8" tubing. Pressure at 2400 hours at 10 psi, flowing back 2 bbls per hour. Recovered a total of 140 bbls during this period with Co2 at 6.5%.
- 06/04/08 Completion day 157. Well open to flow back tank. Flowed back a total of 27 bbls of fluid during this period. Pressure at 10 psi. RU to Swab. RIH. Fluid spotty down to solid fluid at 9800'. Pull from 10,200'. Recovered 2 bbls of very sandy fluid. Swab cups loaded with sand. Made 2 more runs down to S/N. Recovered traces of fluid with large amounts of sand. RD Swab lubricator and prepare to pull out of hole with packer and plug. Unseat packer and attempt to latch onto plug. Unable to get down on plug due to sand. RU and circulate on top of plug. Latch onto plug and pull free. Instantly had gas to surface on both tubing and casing. Killed well on both tubing and casing. Pumped in a total of 130 bbls of fluid. Slight drag on plug. Pulled up 4 stands above top perforations. Shut Down due to heavy rains and lighting that was very close to rig. SDFN, well open to flow back tank. Casing pressure at 700 psi. Flowed back a total of 233 bbls of fluid during this period.
- 06/05/08 Completion day 158. Well open to flow back tank on open choke. Pressure at 0600 100 psi. Flowed back 136 bbls of fluid during this period. RU and kill both tubing and casing with 75 bbls of fluid. RU tongs to pull out of hole and lay down packer and plug. Pulled out of hole with packer and plug. Shut down and killed well twice while pulling out of hole. Packer and plug in good shape and LD same. RU BWWL and RIH with Composite plug. Set plug at 10,839'. Picked up 100' and RIH and tagged solid plug. POOH with W.L. RD BWWL. MU Halliburton Cement retainer and start in hole. With 80 stands in hole well began flowing. Killed well with 120 bbls of fluid. Ran in hole with 125 stands and well flowing. Left well open to flow back tank for the night. Flowed back a total of 320 bbls of fluid during this period.
- 06/06/08 Completion day 159. Well open to flow back tank. Recovered a total of 160 bbls of fluid during this period. 0 pressure. Kill well and finish in hole with Cement retainer and tubing. Move in and RU Halliburton to squeeze. Set cement retainer at 10,425'. Tested same to 1000 psi - OK. Circulated out gas. Squeezed zones with 100 sacks of Premium Class G cement with 0.4 % Halad, 0.2 % HR-5, and 0.3 % CFR-3. 15.8 ppg, 1.15 yield. Pumped in at a rate of 3 bbl p/m. Pressure increased from 500 psi to a max. of 1800 psi at final pump in rate. Pull out of retainer and spot 1 bbl of cement on top of retainer (47'). Top of cement at 10,378'. Mixed and pumped cement with clean fresh water. Pull out of hole with 2 7/8" tubing and lay down setting tool. Shut down for night. Released Flow Back Crew 06-05-2008.

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06/07/08 Completion day 160. Wait on Frac Crew and Co2.

06/08/08 Completion day 161. Wait on Co2.

06/09/08 Completion day 162. Prepare to Perforate Group Q, (17).

06/10/08 Completion day 163. Wait on Co2. Move in and RU BWWL. Make up and RIH with 4" casing Gun. RIH to short joint at 9790'. **Perforate from 9360' to 9364' and from 9186' to 9364'.** Shot 3 SPF. Pulled out of hole. Laid down guns and all shots fired. RD BWWL. Wait on Co2. Halliburton now scheduled Frac for Saturday 06-14-2008.

06/11/08 Completion day 164. Preparing to Frac Group Q. Praxair hauling in Co2.

06/12/08 Completion day 165. Preparing to Frac Group 17, Praxair hauling in Co2.

06/13/08 Completion day 166. Prepare to Frac Group 17.

06/14/08 Completion day 167. Wait on Halliburton and Praxair. Move in and RU Halliburton to Frac. RU Protechnics and BWWL. Held Safety meeting with all personnel on location. Pressure tested all line to 9500 psi – OK. Opened well and filled casing with 4 bbls of fluid. Began pumping and broke down formation at 4396 psi at 9.2 bpm. **Group 17 - Frac well with 126,600 lbs of 20/40 white sand in formation.** Traced all sand with Scandium. Pumped in a total of 750 bbls of fluid. Frac system 70% Co2 Foam. Average wellhead rate 35 bpm, Maxium pressure 5220 psi, Average pressure 4876. ISIP 3237 psi. Frac Gradient 0.79. 5 min. 3168, 10 min. 3120 psi and 15 min 3091 psi. RU BWWL and RIH with Flow Back Plug and set same at 9162'. Pick up 100' and run back in and tag solid plug at 9162. Pull out of hole, PU 4" casing guns and RIH. **Perforate from 9132' to 9136' and from 9076' to 9086'.** Shot both intervals with 3 SPF. Pull out of hole. All shots fired. RD BWWL. Wait on Co2 for Frac. Opened well on 14 choke at 1800 hours. Pressure at 3000 psi bleeding down to 1400 psi. Recovered a total of 232 bbls of fluid during this period.

06/15/08 Completion day 168. Flow well back to flow back while unloading Co2 for the next Frac. Flowing on 18 choke. Pressure at 0600 680 psi. Flowed back a total of 180 bbls of fluid during this period. RU Halliburton. Held Safety Meeting. Pressure test to 8500 psi – OK. Opened well and loaded hole with 85 bbls of fluid. Broke down formation at 4655 psi at 10 BPM. Frac system 70% Co2 foam. **Pumped in a total of 68,700 lb of 20/40 white sand in formation.** Pressure spiked and screened out at 8674 psi leaving 170 sacks of sand in casing (1400'). Max. pumping rate 36.76 BPM. Pumped a total of 496 bbls of fluid. Traced all sand with Antimony. Pressure began to increase when 2# sand hit formation, when 3 # hit it began to increase even faster. 113 tons of Co2 in formation. RD Halliburton and release same. Opened well to flow back tank on 24 choke. Flowed back a total 290 bbls of fluid. Fluid had sand along with a strong concentration of Co2. Pressure bled down to 700 psi during this period.

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06/16/08      Completion day 169. Continued to flow well to flow back tank. Opened well to a open choke. Pressure at 20 psi at 2400 hours making a slight trace of gas. Co2 10%. Flowed back a total of 81 bbls of fluid during this period. Coil tubing unit due in today.

06/17/08      Completion day 170. Well open to flow back tank on open choke. Flowed back a total of 5 bbls of fluid during this period. Left to recover 458 bbls of fluid. Pressure at 60 psi at 0700. Waited on Coil Tubing Services. Late due to tire problems. Arrived on location at 1500 hours. Moved in and rigged up Coil Services. Pressure tested tools – OK. SDFN. Well open on open choke. Recovered no fluid during this period. Left To Recover: 458 bbls.

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**STATE OF UTAH**  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

FORM 9

## SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 999 18th St., Ste. 600 CITY Denver STATE CO ZIP 80202		7. UNIT or CA AGREEMENT NAME: N/A
PHONE NUMBER: (303) 297-2300		8. WELL NAME and NUMBER: RYE PATCH FED 24-21
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606 FNL and 2144 FWL, NENW Section 24, T11S, R14E, SLB&M		9. API NUMBER: 43-013-33443
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E		10. FIELD AND POOL, OR WILDCAT: undesignated
COUNTY: DUCHESNE		STATE: UTAH

### 11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

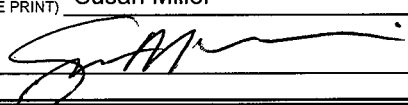
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate)  Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only)  Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: <u>Current Status</u>
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Petro-Canada spud the noted well at 2200 hrs on 08/18/2007.

Completion operations were commenced on 12/31/2007.

As of 07/15/2008, Petro-Canada is continuing completion operations. Attached please find a complete chronological well report to date.

NAME (PLEASE PRINT) <u>Susan Miller</u>	TITLE <u>Regulatory Analyst</u>
SIGNATURE 	DATE <u>7/15/2008</u>

(This space for State use only)

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**JUL 17 2008**

**DIV. OF OIL, GAS & MINING**

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Density/Neutron log. Pulled out of hole, all shots fired and release same. Well Shut in.

- 07/11/08      **Completion Day 194.** Well shut in, moved in and rigged up Halliburton Frac equipment. Waiting on Plaxair.
- 07/12/08      **Completion Day 195.** Well shut in waiting on daylight and Praxair. Preparing to Frac Group T (20). Finished rigging up to Frac. Tested all lines to 9800 psi, ok. Held Safety Meeting. Opened well and loaded casing with 107 bbls of water. Pressure up and broke down formation 2415 psi with 10 bpm. Pumped in formation 100,700 lbs of 20/40 premium sand. Frac system 70% Co2 foam. Average pressure 4119 psi, average rate 38.2 bpm. Pumped a total of 620 bbls of fluid. Traced all sand with scandium. ISIP 3118 psi, Frac Gradient 0.94. 5 min 3041 psi, 10 min 2988 psi, 15 min 2967 psi. Max pressure while pumping 4598 psi. RU BWL, RIH and set Flow through Plug at 6000'. Make up and RIH with 4" casing gun and perforate 5906' to 5914', 4 SPF. Correlated to Baker density/neutron log. Pulled out of hole, all shots fired. Prepare to Frac group U (21) LAST ZONE. Pressure test to 9800 psi, ok. pressure on well at 2800 psi. Open Frac Valve and pump 12 bbls of fluid to load hole. Attempt to break down pressure, pressure went to 9024 psi. Pumps kicked out. Bleed pressure down to 4000 psi and pressured back up. Broke down at 8500 psi. 10 bpm. Pumped a total of 42500 lbs of 20/40 premium sand. Average rate 17.7 bpm, average pumping pressure 3739 psi. ISIP 3249, Frac Gradient 0.98, 5 min 3080 psi, 10 min 3040 psi, 15 min 3027 psi. Traced all sand with antimony. Opened well to pit on 18 choke. Casing pressure at 2900 psi. Flowed back a total of 104 bbls of fluid. Left to recover 818 bbls.
- 07/13/08      **Completion Day 196.** Flowing well to flow back tank on 18 choke. Co2 at 12%+, flowing back very little fluid. Casing pressure at 2300 psi. opened well up to a 24 choke. Pressure increased to 2360 psi, very little water. Co2 12%+, made a total of 163 bbls during this 24 hour period. Left to recover 655 bbls.
- 07/14/08      **Completion Day 197.** Well open to tank on 24 and 30 choke. 12% Co2. Slight traces of fluid. Opened well up to a 36 choke. Flaring gas to pit. Made a total of 41 bbls of fluid during this 24 hour period. Left to recover 614 bbls of fluid. Casing pressure at 30 psi. Will RIH and swab at daylight.

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07/02/08 Completion day 185. Well open to flow back tank during night. Pressure at 120 psi, recovered a total of 15 bbls during this period. Rig up lubricator and run in hole. Tag fluid at 7500'. Made 3 runs pulling from S/N. Recovered a total of 9 bbls of gassy fluid. From 1000 hours to 1200 hours shut swabbing down to check for fluid entry. Made 4 runs pulling from S/N, recovered a total of 36 bbls of gassy fluid with Co2 @ 12%. Blowing dry gas after each swab run. SDFN. Well Shut In. Casing pressure at 310 psi, Tubing at 40 psi. Recovered a total of 60 bbls of fluid during this period. Left to recover 99 bbls.

07/03/08 Completion day 186. Well shut in waiting on daylight. Casing and tubing pressure 400 psi. Rig up lubricator and run in hole to swab. Tag fluid at 5700', pulled from 7500', recovered 9 bbls of fluid. Made a total of 5 runs, pulling from S/N. Recovered a total of 39 bbls of water. Left to recover: 60 bbls. Shut well in for pressure build up.

07/04/08 Completion day 187. Well shut in. SICP 1580 psi and SITP 1150 psi.

07/05/08 Completion day 188. Shut In. SICP 1700 psi and SITP 1560 psi.

07/06/08 Completion day 189. Well Shut in. SICP 1940 psi and SITP 1910 psi.

07/07/08 Completion day 190. Well Shut In. SICP 2050 psi. SITP 2050 psi. Bled down pressure and prepared to swab. Recovered 10 bbls of fluid while bleeding down pressure. Pick up lubricator and prepare to swab. RIH and tag scattered fluid at 3800'. Made a total of 9 runs, pulling from S/N. Scattered fluid on each run. Recovered a total of 9 bbls while swabbing. Good gas flow following each swab and while bleeding down pressure. Well open to pit. Flowing dry gas on 18 choke. Flowing at a rate of approx. 200 MCF P/D. Steady flame with little or no water. Casing pressure at 320 psi. Tubing pressure at 50 psi. 41 bbls of water left to recover. Light traces of Co2.

07/08/08 **Completion Day 191.** Flaring well to pit on 18 choke. Casing pressure 280 psi, Tubing pressure 50 psi. Recovered 3 bbls of fluid during this period. Co2 0%. At 1000 hours opened up choke. Well continued to flow back straight gas with slugs of water occasionally. Recovered a total of 4 bbls during this period. Casing pressure 280 psi, Tubing pressure 20 psi. Co2 0%. Left to recover: 34 bbls of fluid.

07/09/08 **Completion Day 192.** Flaring well to pit on open choke. Solid flame with no fluids during this period. Casing pressure 280 psi, Tubing pressure 20 psi. Left to recover 34 bbls. Pull out of hole with tubing. ND BOP's and Annular. SDFN.

07/10/08 **Completion Day 193.** Check pressure at 0300 hours. SICP 1750 psi. Open well to pit. Well open to pit, casing pressure at 50 psi. Well flowing gas, flowed back approx. 1 bbl of condensate. Flaring well, Co2 0%. RU BWWL, RIH with Composite bridge plug and set at 6315'. Pick up 100', run in and tag solid plug at 6315'. Pull out of hole with line and setting tool. Make up 4" casing guns and RIH. Perforated with 2 SPF from 6121' to 6128' and from 6055' to 6070'. 120 degree phasing, 23.5 gm, .43" diameter hole. Correlated to Baker Z-

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8257', Seating nipple 1 joint above at 8225'. RU to swab, Made 6 runs tagging fluid on the first run at 500'. Swabbed tubing dry on 5th run. Recovered a total of 48 bbls of fluid. Total capacity of tubing 47 1/2 bbls. No fluid or gas entry while swabbing. SDFN

- 06/27/08 Completion day 180. Well Shut In For Night Run in with swab and tag fluid a 5500'. Pulled from S/N. Rig operator pulled up in lubricator breaking cable. weight bars and swab cups and mandrel fell back in tubing. Pulled out of hole with tubing. Break out seating nipple and recovered swab equipment. ND Annular and prepare to Frac. Cleaned up location, Wait on Frac Crews and equipment. WOE
- 06/28/09 Completion day 181. Preparing to Frac.
- 06/29/08 Completion day 182. Prepare to Frac.
- 06/30/08 Completion day 183. WOE Move in and rig up Halliburton to Frac Group S, Casing pressure at 260 psi. Safety Meeting, Pressure tested all lines to 9800 psi, ok. Opened Frac Valve and loaded hole with 71 1/2 bbls of frac fluid. Began pumping pad and valves began leaking on pumper. Value washed out. Shut down and repaired same. Opened well and pumped 70% linear Co2 Foam Frac. Pumped in a total of 70,018 lbs of 20/40 premium white sand. Broke formation down at 4228 at 10 BPM. Max. pumping pressure 6234 psi. max. pumping rate 30.7 BPM. Pumped in a total of 518 bbls of fluid. Average pumping pressure 4261 psi. Final pumping pressure 5879 psi. Flushed short 180 bbls due to faulty reading on blender. Finished displacing 180 bbls at 9456 psi. 5 min 8755 psi, 10 min 8288 psi, 15 min. 7907 psi. Frac Gradient 1.57. Traced all sand with Iridium. Rigging down Halliburton. Poor job. 83 Grizzly had to be repacked before job could start. 83 Grizzly blew packing during 4# sand stage Engineer arrived on location at 1400 hours. Sand cap rubber on on HT-2000 had to be changed ,problems reading Co2 rate. Flushed short due to miscommunication staging off blender. Staged off clean, not foam Moved out Halliburton Opened well to Flow Back Tank on 18 choke. Flowed back a total of 200 bbls of fluid. 12% Co2, Pressure at opening 3200 psi. Pressure at 2400 hours 480 psi.
- 07/01/08 Completion day 184. Well open to Tank on 18 choke. Recovered a total of 100 bbls of fluid during this period. Have a total of 220 bbls left to recover. Pressure at 10 psi. Made up notch collar and S/N and ran in hole. Ran in to 8438', 38' below bottom perforations. Did not tag any fill. Pulled up EOT to 8300'. Pick up lubricator and prepare to Swab RIH with swab and tagged fluid at 3600'. Pulled from 5600' Made a total of 5 runs . Last 3 runs pulling from S/N. Recovered a total vof 51 bbls while swabbing. Fluid gassy with 12% Co2. Slight traces of sand. Well tries to kick off and flow after each swab run. Shut Rig down for night. Well on open choke to flow back tank. Well flowed 10 bbls of fluid and died. Flowed and swabbed back a total of 61 bbls of fluid. 159 BBLs left to recover.



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Recovered a total of 33 bbls of fluid while swabbing. Well kicked off and started flowing. Flowing well back to flow back tank. Flowing on a 24 choke with a pressure of 500 psi to 200 psi. Recovered a total of 283 bbls of fluid. This includes the 33 bbls from swab with Co2 content high, 12.5%. Left to recover = 458 bbls + 75 bbls used pumped while cleaning out sand = 533 bbls -+ less 283 = 250 bbls left to recover.

- 06/20/08 Completion day 173. No report.
- 06/21/08 Completion day 174. Continued to flow well to flow back tank on 24 choke. Well flowed back a total of 140 bbls of fluid during this period. Pressure was all over the board, high was 460 psi and low was 220 psi during this period. Well making some gas with a very high Co2 content of 12%. Left to recover 110 bbls.
- 06/22/08 Completion day 175. Continue to flow back well on 24 choke. Flowed back a total of 115 bbls during this period. Have recovered 5 bbls of fluid over load pumped on this stage. Water is drying up and pressure still running between 400 psi and 220 psi. Co2 content at 12%.
- 06/23/08 Completion day 176. Well open to flow back tank. Did not flow back any fluids during this period. Pressure bled from 240 psi on 14 choke to 0 when opened to pit. Rigged down Lubricator and swab equipment and lay down same. Pumped 30 bbls of clean fresh water down tubing. Pull out of hole. Did not need to pump any additional fluid down tubing while pulling out of the hole. Make up Halliburton 5 1/2" cement retainer and run in hole. Set retainer at 9054'. Filled annulus with 41 bbls of water and tested to 500 psi – OK. SDFN, Wait on Halliburton cement to Squeeze.
- 06/24/08 Completion day 177. SDFN. Wait on Cement and Halliburton truck and crew. Halliburton arrived at 0800 hrs. Rig up Halliburton and Held safety meeting with all personnel. Pressure tested all lines to 5000 psi – OK. Squeezed zone with 100 sacks of Premium Class G cement, 0.4 % Halad R 344, 0.2% HR-5, and 0.3% CFR-3 W/O De-foamer. Pumped cement with fresh water from frac tanks. Establish injection rate of 3.5 bpm at 1600 psi. Cement pumped at 15.8 PPG, yield 1.15. Mix Fluid 4.93 with pressure at 3000 psi with 15 bbls of cement in formation. Slowed rate to 1 bpm for last 4.5 bbls. Left 1 bbl in tubing and displaced same on top of plug when stinging out of retainer. Pressure at 2100 psi and holding when pulled out of stinger. Pulled 1 joint and reversed out. Reversed 75 bbls. Recovered out about 1/2 bbl of cement while reversing. Rigged down Halliburton and released same. Pulled out of hole with tubing. LD Halliburton Setting Tool. SDFN.
- 06/25/08 Completion day 178. Prepare to perforate.
- 06/26/08 Completion day 179. Wait on daylight., Prepare to perforate Rig up rig pump and pressure up to 500 psi on casing. Held ok. Moved in and rigged up BWWL RIH with 18' - 4" casing gun and Perforate 2 SPF at 8,382' to 8,400'. Correlated back to Baker Z-density / neutronlog. Pulled out of hole with gun, all shots fired. RIH with 2 7/8" tubing to Swab. No pressure was seen when perforating. EOT at

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Maxium pressure 5220 psi, Average pressure 4876. ISIP 3237 psi. Frac Gradient 0.79. 5 min. 3168, 10 min. 3120 psi and 15 min 3091 psi. RU BWWL and RIH with Flow Back Plug and set same at 9162'. Pick up 100' and run back in and tag solid plug at 9162. Pull out of hole, PU 4" casing guns and RIH. **Perforate from 9132' to 9136' and from 9076' to 9086'.** Shot both intervals with 3 SPF. Pull out of hole. All shots fired. RD BWWL. Wait on Co2 for Frac. Opened well on 14 choke at 1800 hours. Pressure at 3000 psi bleeding down to 1400 psi. Recovered a total of 232 bbls of fluid during this period.

- 06/15/08 Completion day 168. Flow well back to flow back while unloading Co2 for the next Frac. Flowing on 18 choke. Pressure at 0600 680 psi. Flowed back a total of 180 bbls of fluid during this period. RU Halliburton. Held Safety Meeting. Pressure test to 8500 psi – OK. Opened well and loaded hole with 85 bbls of fluid. Broke down formation at 4655 psi at 10 BPM. Frac system 70% Co2 foam. **Pumped in a total of 68,700 lb of 20/40 white sand in formation.** Pressure spiked and screened out at 8674 psi leaving 170 sacks of sand in casing (1400'). Max. pumping rate 36.76 BPM. Pumped a total of 496 bbls of fluid. Traced all sand with Antimony. Pressure began to increase when 2# sand hit formation, when 3 # hit it began to increase even faster. 113 tons of Co2 in formation. RD Halliburton and release same. Opened well to flow back tank on 24 choke. Flowed back a total 290 bbls of fluid. Fluid had sand along with a strong concentration of Co2. Pressure bled down to 700 psi during this period.
- 06/16/08 Completion day 169. Continued to flow well to flow back tank. Opened well to a open choke. Pressure at 20 psi at 2400 hours making a slight trace of gas. Co2 10%. Flowed back a total of 81 bbls of fluid during this period. Coil tubing unit due in today.
- 06/17/08 Completion day 170. Well open to flow back tank on open choke. Flowed back a total of 5 bbls of fluid during this period. Left to recover 458 bbls of fluid. Pressure at 60 psi at 0700. Waited on Coil Tubing Services. Late due to tire problems. Arrived on location at 1500 hours. Moved in and rigged up Coil Services. Pressure tested tools – OK. SDFN. Well open on open choke. Recovered no fluid during this period. Left To Recover: 458 bbls.
- 06/18/08 Completion day 171. Well open to pit on open choke. Pressure at 20 psi. Recovered no fluid during this period. Make up bit and Weatherford motor. Pressure test coil unit to 2500 psi – OK. Function test BOP's to 3000 psi - OK. Held Safety meeting. RIH to 7000'. Circulate and wait on returns at 2.5 bpm. Pressure at well head 180 psi. Tag sand at 7680'. RIH circulating out Co2 and traces of sand. Circulated hole clean down to Flow Through Plug at 9162'. Tagged plug, Picked up and circulated another bottoms up. Hole clean, Flowing back Co2. Pressure at wellhead at 180 psi. Pulled out of hole and RD Coil Tubing Services. Shut well in for night to check build up pressure.
- 06/19/08 Completion day 172. Well open to flow back tank on open choke, no fluid during this period. Pressure at 20 psi. RIH with tubing to swab. Seating nipple at 8950'. Top perforations at 9076'. Pick up lubricator and prepare to swab. RIH with swab and tagged fluid at surface. Made 4 runs pulling from 3100'.

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06/05/08 Completion day 158. Well open to flow back tank on open choke. Pressure at 0600 100 psi. Flowed back 136 bbls of fluid during this period. RU and kill both tubing and casing with 75 bbls of fluid. RU tongs to pull out of hole and lay down packer and plug. Pulled out of hole with packer and plug. Shut down and killed well twice while pulling out of hole. Packer and plug in good shape and LD same. RU BWWL and RIH with Composite plug. Set plug at 10,839'. Picked up 100' and RIH and tagged solid plug. POOH with W.L. RD BWWL. MU Halliburton Cement retainer and start in hole. With 80 stands in hole well began flowing. Killed well with 120 bbls of fluid. Ran in hole with 125 stands and well flowing. Left well open to flow back tank for the night. Flowed back a total of 320 bbls of fluid during this period.

06/06/08 Completion day 159. Well open to flow back tank. Recovered a total of 160 bbls of fluid during this period. 0 pressure. Kill well and finish in hole with Cement retainer and tubing. Move in and RU Halliburton to squeeze. Set cement retainer at 10,425'. Tested same to 1000 psi – OK. Circulated out gas. Squeezed zones with 100 sacks of Premium Class G cement with 0.4 % Halad, 0.2 % HR-5, and 0.3 % CFR-3. 15.8 ppg, 1.15 yield. Pumped in at a rate of 3 bbl p/m. Pressure increased from 500 psi to a max. of 1800 psi at final pump in rate. Pull out of retainer and spot 1 bbl of cement on top of retainer (47'). Top of cement at 10,378'. Mixed and pumped cement with clean fresh water. Pull out of hole with 2 7/8" tubing and lay down setting tool. Shut down for night. Released Flow Back Crew 06-05-2008.

06/07/08 Completion day 160. Wait on Frac Crew and Co2.

06/08/08 Completion day 161. Wait on Co2.

06/09/08 Completion day 162. Prepare to Perforate Group Q, (17).

06/10/08 Completion day 163. Wait on Co2. Move in and RU BWWL. Make up and RIH with 4" casing Gun. RIH to short joint at 9790'. **Perforate from 9360' to 9364' and from 9186' to 9364'.** Shot 3 SPF. Pulled out of hole. Laid down guns and all shots fired. RD BWWL. Wait on Co2. Halliburton now scheduled Frac for Saturday 06-14-2008.

06/11/08 Completion day 164. Preparing to Frac Group Q. Praxair hauling in Co2.

06/12/08 Completion day 165. Preparing to Frac Group 17, Praxair hauling in Co2.

06/13/08 Completion day 166. Prepare to Frac Group 17.

06/14/08 Completion day 167. Wait on Halliburton and Praxair. Move in and RU Halliburton to Frac. RU Protechnics and BWWL. Held Safety meeting with all personnel on location. Pressure tested all line to 9500 psi – OK. Opened well and filled casing with 4 bbls of fluid. Began pumping and broke down formation at 4396 psi at 9.2 bpm. **Group 17 - Frac well with 126,600 lbs of 20/40 white sand in formation.** Traced all sand with Scandium. Pumped in a total of 750 bbls of fluid. Frac system 70% Co2 Foam. Average wellhead rate 35 bpm,

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tubing. Set Packer and tested plug to 1000 psi. Held solid. Released pressure and pulled up and set packer at 10,665'. Will test zone 2 with perforations at 10,682' to 698', 10,738' to 10,748', 10,777' to 10,781', 10,827', to 10,834'. RU Swab lubricator. Pick up mandrel and swab cups. RIH and tag fluid at surface. Well began flowing. Flowing well back to rig tank. Well flowed back 158 bbls of fluid during this period. Flowing back on 24 choke. Pressure at 300 psi, casing at 400 psi.

- 05/31/08 Completion day 153. Continued to flow well on 24 choke. Flowing well to flow back tank. Flowed back a total of 183 bbls of fluid during this period. Pressure at 240 psi, well flowing back approximately 300 MCF per day. DC\$15,880, CC\$5,006,244
- 06/01/08 Completion day 154. Flowing back well to pit on open choke. Flowed back 148 bbls during this period. Average of 6.1 bbls p/h. Casing pressure at 2400 psi, Co2 = 3%, and Resistivity at 1500. Flowing back gas at a rate of approximately 300 MCF p/d. Tubing pressure at 40 psi.
- 06/02/08 Completion day 155. Continue to flow well to tank on open choke. Recovered a total of 24 bbls of fluid during this period. Continues to make approximately 300 MCF p/d with 0 psi on tubing, 2600 psi on casing. Bleed down pressure on casing and prepare to move up and test zone 3. Pump 50 bbls of fluid down tubing and casing. Unseat packer, Run in and attempt to latch onto plug. Could not get latched up due to sand. RU and circulate sand out of hole. Latched on to plug and attempted to set several times at 10,638'. Finally set and tested to 1000 psi - OK. Pulled up and set packer at 10,439'. RU to Swab. Installed new head on lubricator that was damaged. RIH with swab and tag fluid at 2100'. Pull from 3100' and recovered 6 bbls of fluid. Well open to flow back tank. SDFN.
- 06/03/08 Completion day 156. Well open to flow back tank. At 0200 well began flowing up tubing. Flowed a total of 100 bbls. Tubing pressure at 40 psi. Continued to flow well up tubing to flow back tank. Pressure began dropping along with flow back water. Not enough pressure to unload water with 2 7/8" tubing. Pressure at 2400 hours at 10 psi, flowing back 2 bbls per hour. Recovered a total of 140 bbls during this period with Co2 at 6.5%.
- 06/04/08 Completion day 157. Well open to flow back tank. Flowed back a total of 27 bbls of fluid during this period. Pressure at 10 psi. RU to Swab. RIH. Fluid spotty down to solid fluid at 9800'. Pull from 10,200'. Recovered 2 bbls of very sandy fluid. Swab cups loaded with sand. Made 2 more runs down to S/N. Recovered traces of fluid with large amounts of sand. RD Swab lubricator and prepare to pull out of hole with packer and plug. Unseat packer and attempt to latch onto plug. Unable to get down on plug due to sand. RU and circulate on top of plug. Latch onto plug and pull free. Instantly had gas to surface on both tubing and casing. Killed well on both tubing and casing. Pumped in a total of 130 bbls of fluid. Slight drag on plug. Pulled up 4 stands above top perforations. Shut Down due to heavy rains and lightning that was very close to rig. SDFN, well open to flow back tank. Casing pressure at 700 psi. Flowed back a total of 233 bbls of fluid during this period.

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- 05/26/08 Completion day 148. Well open to pit, 100 psi on open choke. Flowed back 290 bbls of fluid. Kill well with 100 bbls of fluid, remove TIW. Well on vacuum. RIH and tagged plug at 10,640'. No fill on perfs above plug. Drill plug, tagged solid fill from 10,700' to 10,800'. Appears all of these perfs were sanded off. Drill Plug at 10,860'. RIH to 11,000'. No fill. Circulate hole clean. Strong blow on casing. Lay down power swivel. Pull out of hole with 25 stands. EOT at 9300'. Install TIW valve and SDFN. Shut well in and pressure went to 1800 psi in 15 minutes. Open well to pit and pressure decreased to 200 psi at 2400 hours. Recovered a total of 470 bbls of fluid.
- 05/27/08 Completion day 149. Well open to pit. Pressure on casing 200 psi. Recovered a total of 470 bbls of fluid during this period. Killed well with 100 bbls of fluid and pulled out of hole with 140 stands of tubing. Well began flowing up tubing. Killed well with 100 bbls of fluid. Pulled out of hole with 160 stands of tubing. Well flowing. Chained down tubing to BOP's, killed well with 100 bbls of fluid. Pumping fluid down tubing through TIW valve. Pulled out of hole and laid down bit. Made up Halliburton Packer and Plug and started in hole with 32 stands in hole, well flowing. Killed well with 100 bbls of fluid and RIH with 65 stands. Well flowing. Installed TIW valve and SDFN. Well open to pit. Recovered a total of 240 bbls of fluid. Pressure at 200 psi.
- 05/28/08 Completion day 150. Well open to pit. Recovered a total of 240 bbls of fluid. Pressure at 200 psi. Kill well with 120 bbls of fluid. Ran In Hole with 2 7/8' tubing. Killed well with 100 bbls of fluid and 75 bbls of fluid while running in hole. Well flows back through tubing and up casing. Set packer at 10,825'. Set packer with 12,000#. RU lubricator to swab down tubing. While rigging up to swab well began flowing up tubing. Flowed a total of 57 bbls of fluid. After 57 bbls of fluid well began flowing solid gas with traces of water. Hooked up well to flow back through manifold and flow back tank in order to record pressure and to measure water. Pressure increased to 400 psi. Flow checking well on 14 choke. Pressure built to 400 psi. Flow back rate is 4.8 bbls per hour.
- 05/29/08 Completion day 151. Well on 14 choke until 0700. Flowed back a total of 73 bbls in 15 hours. Flowed back at a rate of 116 bbls per day. Pressure at 400 psi. Water and gas samples caught at 0700 hours. Both will be sent to town for analysis. Opened casing and began bleeding down pressure. Pressure at 1750 psi. Pressure staying at 500 psi. Opened tubing to a 48 choke and pressure bled to 100 psi. Flowing gas with traces of water. Put well back on 14 choke to record pressure and to measure water flow. Pressure back up to 380 psi in 1 hour. Well open on 14 choke. Pressure at 380 psi. Recovered a total of 46 bbls of fluid during this period. Averaging about 2 bbls per hour. Steady gas flow during this period. Estimate 250 to 300 MCF.
- 05/30/08 Completion day 152. At 2400 hours opened well to 48 choke. Well pressure bleed from 380 psi to 100 psi. Recovered a total of 14 bbls of water during this period. Average of 2.3 bbls of fluid for this flow period. Continued to flow gas at a rate of approx. 100 MCF. Casing pressure at 2600 psi. Opened casing to pit and began bleeding off pressure. Pressure bled down to 300 psi. Rigged up and killed well with 100 bbls of fluid. Set Plug at 10,899'. Pulled up and LD 1 joint of

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05/17/08 Completion day 139. Continue to flow back well on 14 choke. Pressure holding steady at 1200 psi. Flowed back a total of 170 bbls during this period. Again, fluid decreasing each day. Recovered a total of 2131 bbls since last Frac. Co2 level at 7% at 0700 and 9% at 1200 hours and 9% at 2100 hours.

05/18/08 Completion day 140. Continued to flow well back on a 14 choke. Pressure at 1100 psi. Recovered a total of 159 bbls of fluid during this period. Averaging 6.6 bbls per hour. Fluid recovery continues to drop each 24 hours. Co2 10% at 0700, 9% at 1400 hours and 9% at 2200 hours. Recovered a total of 2290 bbls since last Frac.

05/19/08 Completion day 141. Continued to flow well back on 14 choke. Pressure at 1000 psi. Recovered a total of 169 bbls of fluid during this period. Recovered a total of 2459 bbls since last Frac. Co2 at 0700 8%, Co2 at 1200 noon 8%, Co2 at 1500 hours 7%, Co2 at 2000 hours and 7%. Fluid will not burn.

05/20/08 Completion day 142. Continued to flow well on 14 choke. Pressure at 1000 psi. Recovered a total of 149 bbls of fluid during this period. Recovered a total of 2608 bbls of fluid since the last Frac. Co2 at 7% at 0700 hours. Co2 at noon 5.5%, same at 1700 hours. Released and hauled off location 10 rental Frac Tanks.

05/21/08 Completion day 143. No report.

05/22/08 Completion day 144. Well continues to flow back on 36 choke. Recovered a total of 730 bbls during this period. Recovered a total of 4121 bbls of fluid since last Frac. Co2 at 0700 = 6%, At noon = 6.5%, at 1900 = 7% and Resistivity: 1600.

05/23/08 Completion day 145. Continued to flow well on 36 & 48 choke. Pressure holding at 225 psi. Rig up rig floor, set in and hook up tongs and slips. Install 5 K Annular. Hook up lines from rig pump to kill line. Fill Rig tank with 175 bbls of water from Frac Tank. Move 2 7/8" tubing from behind location to pipe racks. Measure and rabbit same. Rig Repairs, working on Hydraulics. Pumped in 100 bbls of clean fresh water to kill well. Pressure at 0 psi. Well open with 0 pressure.

05/24/08 Completion day 146. No report.

05/25/08 Completion day 147. Well open to pit. Pressure at 100 psi. Recovered a total of 370 bbls of fluid during this period. Pump 60 bbls of fluid down tubing and 100 bbls of fluid down casing to kill well. RIH with 237 joints of tubing and well began flowing up tubing. Pump 60 bbls down tubing and 80 bbls down casing. RIH with 327 joints of tubing and tag Flow Through Plug at 10,640'. Kill well with 80 bbls of fluid. Pull up above top perforation at 10,471'. Install TIW Valve on tubing. Open well up to pit for night. Spot in Power Swivel and SDFN. Well open to pit. Flowing back water and gas.

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

AMENDED REPORT ☐ FORM 8  
(highlight changes)

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

1a. TYPE OF WELL: OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> DRY <input type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
b. TYPE OF WORK: NEW WELL <input checked="" type="checkbox"/> HORIZ. LATS. <input type="checkbox"/> DEEP-EN <input type="checkbox"/> RE-ENTRY <input type="checkbox"/> DIFF. RESVR. <input type="checkbox"/> OTHER _____		6. IF INDIAN, ALLOTTEE OR TRIBE NAME N/A
2. NAME OF OPERATOR: Petro-Canada Resources (USA) Inc		7. UNIT or CA AGREEMENT NAME N/A
3. ADDRESS OF OPERATOR: 999 18th St, Suite 600 CITY Denver STATE CO ZIP 80202		8. WELL NAME and NUMBER: Rye Patch Fed 24-21
4. LOCATION OF WELL (FOOTAGES) AT SURFACE: 606' FNL and 2144' FWL AT TOP PRODUCING INTERVAL REPORTED BELOW: 606' FNL and 2144' FWL AT TOTAL DEPTH: 606' FNL and 2144' FWL		9. API NUMBER: 4301333443
10. FIELD AND POOL, OR WILDCAT undesigned		11. QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E
12. COUNTY Duchesne		13. STATE UTAH

14. DATE SPUDDED: 8/18/2007	15. DATE T.D. REACHED: 10/21/2007	16. DATE COMPLETED: 8/28/2008	ABANDONED <input type="checkbox"/> READY TO PRODUCE <input checked="" type="checkbox"/>	17. ELEVATIONS (DF, RKB, RT, GL): 6969' GL/6995' KB
18. TOTAL DEPTH: MD 15,500 TVD	19. PLUG BACK T.D.: MD 15,430 TVD	20. IF MULTIPLE COMPLETIONS, HOW MANY? * N/A		21. DEPTH BRIDGE MD 11,040 PLUG SET: TVD
22. TYPE ELECTRIC AND OTHER MECHANICAL LOGS RUN (Submit copy of each) CBL, Borehole Profile, Multipole Array Acoustilog, Induction Log, GR Compensated Neutron mud cell Comp 2, Den. HDI			23. WAS WELL CORED? NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> (Submit analysis) WAS DST RUN? NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> (Submit report) DIRECTIONAL SURVEY? NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> (Submit copy)	

24. CASING AND LINER RECORD (Report all strings set in well)

HOLE SIZE	SIZE/GRADE	WEIGHT (#/ft)	TOP (MD)	BOTTOM (MD)	STAGE CEMENTER DEPTH	CEMENT TYPE & NO. OF SACKS	SLURRY VOLUME (BBL)	CEMENT TOP **	AMOUNT PULLED
12-1/4"	9-5/8" J-55	36	0	1,424		Lt 390		0	
8-3/4"	5-1/2" L-80	23	0	15,435		50/50 2700		1040	

25. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)	SIZE	DEPTH SET (MD)	PACKER SET (MD)	SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-7/8"	10,430							

26. PRODUCING INTERVALS

FORMATION NAME	TOP (MD)	BOTTOM (MD)	TOP (TVD)	BOTTOM (TVD)	INTERVAL (Top/Bot - MD)	SIZE	NO. HOLES	PERFORATION STATUS
(A) Blackhawk	10,471	10,834			See attachment			Open <input type="checkbox"/> Squeezed <input type="checkbox"/>
(B)					5906-15056			Open <input type="checkbox"/> Squeezed <input type="checkbox"/>
(C)								Open <input type="checkbox"/> Squeezed <input type="checkbox"/>
(D)								Open <input type="checkbox"/> Squeezed <input type="checkbox"/>

27. PERFORATION RECORD

28. ACID, FRACTURE, TREATMENT, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND TYPE OF MATERIAL
See attachment	

29. ENCLOSED ATTACHMENTS:

- ☒ ELECTRICAL/MECHANICAL LOGS ☒ GEOLOGIC REPORT ☐ DST REPORT ☐ DIRECTIONAL SURVEY  
☐ SUNDRY NOTICE FOR PLUGGING AND CEMENT VERIFICATION ☐ CORE ANALYSIS ☐ OTHER: \_\_\_\_\_

30. WELL STATUS:

Producing

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## 31. INITIAL PRODUCTION

## INTERVAL A (As shown in item #26)

DATE FIRST PRODUCED: 8/28/2008	TEST DATE: 9/16/2008	HOURS TESTED: 24	TEST PRODUCTION RATES: →	OIL – BBL: 0	GAS – MCF: 750	WATER – BBL: 0	PROD. METHOD: flowing
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	INTERVAL STATUS:

## INTERVAL B (As shown in item #26)

DATE FIRST PRODUCED:	TEST DATE:	HOURS TESTED:	TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	INTERVAL STATUS:

## INTERVAL C (As shown in item #26)

DATE FIRST PRODUCED:	TEST DATE:	HOURS TESTED:	TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	INTERVAL STATUS:

## INTERVAL D (As shown in item #26)

DATE FIRST PRODUCED:	TEST DATE:	HOURS TESTED:	TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	INTERVAL STATUS:

## 32. DISPOSITION OF GAS (Sold, Used for Fuel, Vented, Etc.)

Sold

## 33. SUMMARY OF POROUS ZONES (Include Aquifers):

Show all important zones of porosity and contents thereof: Cored intervals and all drill-stem tests, including depth interval tested, cushion used, time tool open, flowing and shut-in pressures and recoveries.

## 34. FORMATION (Log) MARKERS:

Formation	Top (MD)	Bottom (MD)	Descriptions, Contents, etc.	Name	Top (Measured Depth)
				Green River	0
				Wasatch	3,350
				North Horn	5,500
				U. Price River	7,350
				Bluecastle	9,200
				Castlegate	9,950
				Blackhawk	10,200
				Mancos Transition	10,900
				Mancos	11,032
				Dakota	15,000

## 35. ADDITIONAL REMARKS (Include plugging procedure)

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records.

NAME (PLEASE PRINT) Amy Karwan

TITLE Operations Technician

SIGNATURE



DATE 9/16/2008

This report must be submitted within 30 days of

- completing or plugging a new well
- drilling horizontal laterals from an existing well bore
- recompleting to a different producing formation
- reentering a previously plugged and abandoned well
- significantly deepening an existing well bore below the previous bottom-hole depth
- drilling hydrocarbon exploratory holes, such as core samples and stratigraphic tests

\* ITEM 20: Show the number of completions if production is measured separately from two or more formations.

\*\* ITEM 24: Cement Top – Show how reported top(s) of cement were determined (circulated (CIR), calculated (CAL), cement bond log (CBL), temperature survey (TS)).

Send to: Utah Division of Oil, Gas and Mining  
1594 West North Temple, Suite 1210  
Box 145801  
Salt Lake City, Utah 84114-5801

Phone: 801-538-5340

Fax: 801-359-3940

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Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443

Perforation Intervals:

Wasatch Fm.

5,906'- 5,914'

6,055'-70', 6,121'-28'

Price River Fm.

8,382'- 8,400'

Blue Castle Fm.

9,076'-86', 9,132'-36'

9,186'-90', 9,360'-64'

Black Hawk Fm.

10,471'-78', 10,522'-28',  
10,574'-86'

10,682'-98', 10,738'-48',  
10,777'-81', 10,827'-34'

10,932'- 10,943'

Mancos Fm.

11,228'-36', 11,172'-80',  
11,074'-82'

11,587'-92', 11,499'-506',  
11,480'-86', 11,466'-72'

11,967'-72', 11,847'-52',  
11,781'-86'

12,375'-80', 12,330'-36',  
12,120'-26'

12,939'-43', 12,860'-64',  
12,808'-20', 12,667'-72'

13,510'-15', 13,335'-40',  
13,305'-10', 13,082'-87'

13,898'-906', 13,792'-  
800', 13,730'-38'

14,382'-87', 14,315'-20',  
14,203'-08', 14,156'-68',  
14,108'-13'

14,565'-76', 14,489'-502'

14,720'-25', 14,788'-803',  
14,913'-18'

15,325'-30', 15,250'-55',  
15,050'-58', 14,994'-98'

15,370'-75'

Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443

Frac Summaries (20):

CO2 Frac'd 7/12/08 brk 8500#, 302 BW, 42500# 20/40 White, Trace Sb, ISIP 3249#, 15 min 3027#, cmt sqz'd

CO2 Frac'd 7/12/08 brk 2415#, 620 BW, 100700# 20/40 White, Trace Sc, ISIP 3118#, 15 min 2967#, cmt sqz'd

CO2 Frac'd 6/30/08 brk 4288#, 518 BW, 70,018# 20/40 White, 113T CO2, Trace Ir, ISIP 9456#, 15 min 7907#, cmt sqz'd

CO2 Frac'd 6/15/08 brk 4655#, 496 BW, 68700# 20/40 White, 113T CO2, screen out 3 ppg, Trace Sb, ISIP 3237#, wet - cmt sqz'd

CO2 Frac'd 6/14/08 brk 4396#, 750 BW, 126600# 20/40 White, Trace Sc, ISIP 3237#, wet - cmt sqz'd

CO2 Frac'd 5/12/08 brk 5014#, 835 BW, 121100# 20/40 PRC, 170T CO2, Trace Ir, ISIP 3805#, cmt sqz'd

CO2 Frac'd 5/7/08 brk 5382#, 780 BW, 150200# 20/40 PRC, 244T CO2, Trace Sb, ISIP 4747#

CO2 Frac'd 5/6/08 brk 6602#, 950 BW, 89000# 20/40 PRC, 240T CO2, Trace Sc, ISIP 4697#

Slick wtr Frac'd 2/20/08 brk 7049#, 3788 BW, 60300# 30/50 PRC, Trace Ir, ISIP 4980#

Slick wtr Frac'd 2/19/08 brk 7560#, 3363 BW, 50000# 30/50 PRC, Trace Sb, ISIP 5100#

Slick wtr Frac'd 2/4/08 brk 8603#, 2673 BW, 23539# 30/50 PRC, Trace Ir, ISIP 6053#

Slick wtr Frac'd 2/3/08 brk 7859#, 3810 BW, 59383# 30/50 PRC, Trace Sc, ISIP 6449#

Slick wtr Frac'd 2/2/08 brk 8408#, 3960 BW, 60010# 30/50 PRC, Trace Sb, ISIP 7758#

Slick wtr Frac'd 1/31/08 brk 110348#, 2803 BW, 32096# 30/50 ISP, Trace Sc, ISIP 7520#

Slick wtr Frac'd 1/30/08 brk 9862#, 1278 BW, 4000# 30/50 ISP, Trace Ir, ISIP 8944#

1/23/08 Slick wtr Frac'd 1/23/08 brk 9530#, 1787 BW, 15130# 30/50 ISP, Trace Sb, ISIP 7420#

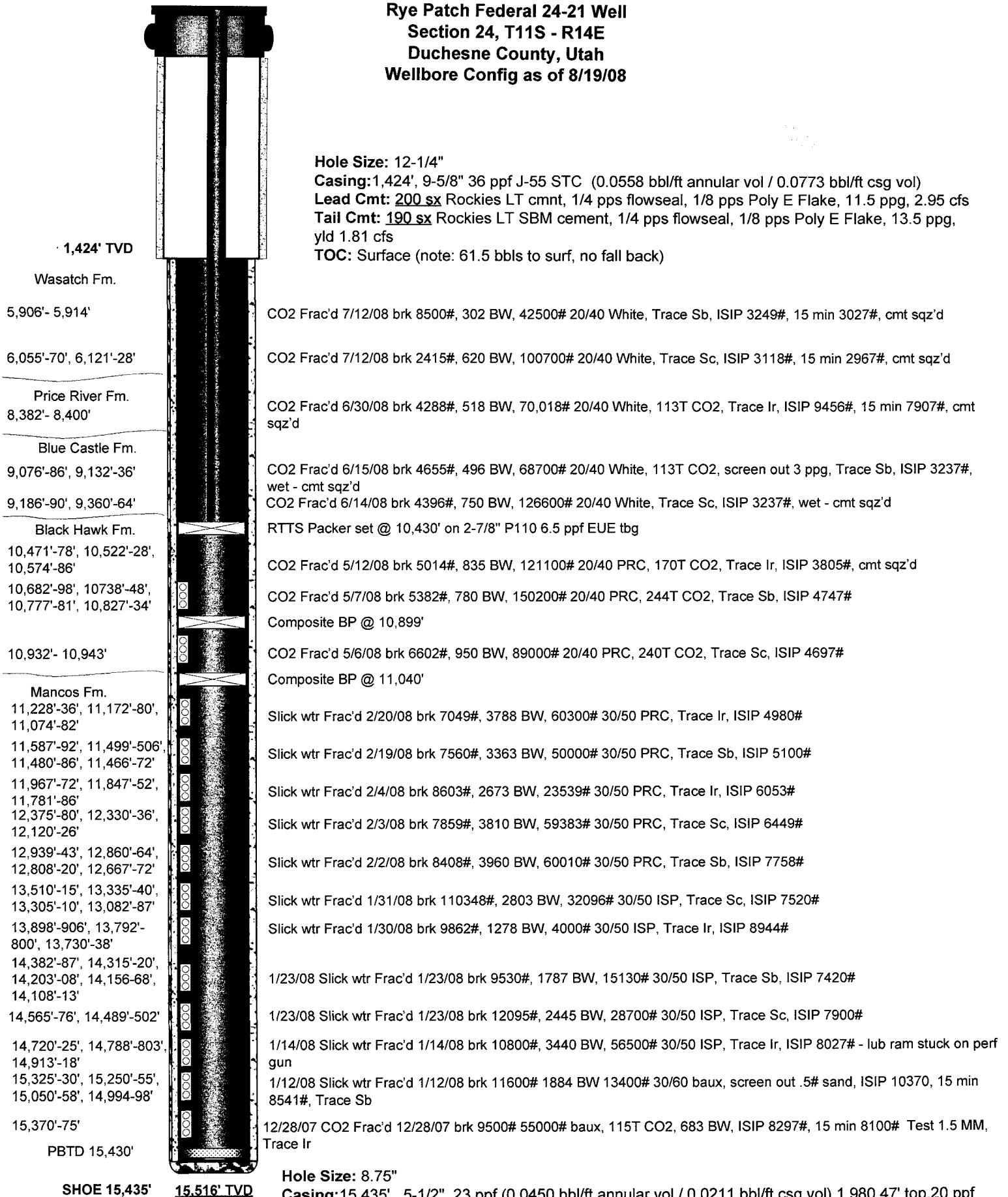
1/23/08 Slick wtr Frac'd 1/23/08 brk 12095#, 2445 BW, 28700# 30/50 ISP, Trace Sc, ISIP 7900#

1/14/08 Slick wtr Frac'd 1/14/08 brk 10800#, 3440 BW, 56500# 30/50 ISP, Trace Ir, ISIP 8027# - lub ram stuck on perf gun

1/12/08 Slick wtr Frac'd 1/12/08 brk 11600# 1884 BW 13400# 30/60 baux, screen out .5# sand, ISIP 10370, 15 min 8541#, Trace Sb

12/28/07 CO2 Frac'd 12/28/07 brk 9500# 55000# baux, 115T CO2, 683 BW, ISIP 8297#, 15 min 8100# Test 1.5 MM, Trace Ir

**Rye Patch Federal 24-21 Well  
Section 24, T11S - R14E  
Duchesne County, Utah  
Wellbore Config as of 8/19/08**



**Hole Size:** 8.75"

**Casing:** 15,435', 5-1/2", 23 ppf (0.0450 bbl/ft annular vol / 0.0211 bbl/ft csg vol) 1,980.47' top, 20 ppf L80 LTC (0.0221 bbl/ft csg vol) 11,445.00', 23 ppf 2,009.53' bottom

**Cmt:** Lead: 1,800 sx Premium 50/50 Poz Cement + 20% SSA1, 3 pps Silicalite, 0.5% Halad 344, 0.2% HR12, .1% HR5, .2% Super CBL, .2% Suspend HT Yield 1.89 cfs, 13.0 ppg slurry.

Tail: 900 sx Premium 50/50 Poz Cement + 20% SSA1, 3 pps Silicalite, 0.5% Halad 344, 0.2% HR12, .2% Super CBL, .2% Suspend HT Yield 1.91 cfs, 13.0 ppg slurry.

**TOC:** ±1,040' (CBL 11/23/2007 Note: 96 bbls cmt to surface)

**GEOLOGIC WELLSITE REPORT**

**Petro-Canada Resources**



**Rye Patch Federal 24-21  
Sec 24, T11S, R14E  
Duchesne County, Utah**

**Lisa Guttery and Paula Reed  
Consulting Geologists  
Entrada GeoSciences, LLC  
11 Inverness Way South  
Englewood, CO 80112**

**RECEIVED**  
**SEP 23 2008**  
**DIV. OF OIL, GAS & MINING**

## WELL SUMMARY

The Rye Patch Federal 24-21 well was drilled primarily to test the Cretaceous Mancos Formation. As the well continued on, the Cretaceous Dakota Formation became a significant zone to focus on. Unfortunately, it was undetermined if the Dakota Formation was actually encountered.

Entrada GeoSciences mobilized to the site on September 1<sup>st</sup>, 2007. The surface formation on the Rye Patch Federal 24-21 well was the Green River Formation. Gas detection and sample catching began immediately out of surface casing at 1,480 feet on September 2<sup>nd</sup>. The first formation top drilled was the Wasatch Formation at approximately 3,350 feet, which was reached on the 3<sup>rd</sup> of September. The next formation top drilled was the North Horn Member, which was drilled at roughly 5,500 feet on the 5<sup>th</sup> of September. Bit number two was installed on the 6<sup>th</sup> of September. The Upper Price River Formation was reached at approximately 7,372 feet, on the 9<sup>th</sup> of September. Bit number three was installed shortly after encountering the Upper Price River Formation.

The Bluecastle Formation was drilled at approximately 9,200 feet on the 16<sup>th</sup> of September 2007 following two more bit changes. Bit number six was installed immediately after drilling through the top of the Bluecastle Formation. Two more bit changes were required while drilling through the Bluecastle Formation. The next formation top reached was the Castlegate Sandstone, which was drilled at a depth of approximately 9,900 feet on the 22<sup>nd</sup> of September. Bit number nine was installed immediately after drilling through the Castlegate Sandstone. The Blackhawk Formation was encountered at a depth of approximately 10,100 feet on the 26<sup>th</sup> of September, after two more bit changes were required.

The Mancos transition was approximately reached at a depth of 10,920 feet on the 1<sup>st</sup> of October 2007 following three more bit changes. The Mancos Formation was reached at 11,032 feet on the 2<sup>nd</sup> of October. Drilling went significantly faster in the Mancos Formation. Two more bit changes were performed due to low ROP rates while drilling through the Mancos Formation.

Total depth for the Rye Patch Federal 24-21 well was reached at 15,500 feet on the 21<sup>st</sup> of October 2007. Due to numerous hole condition problems, electric logs were unable to be performed and Entrada GeoSciences was released on the 26<sup>th</sup> of October 2007.

## GEOLOGICAL SUMMARY

The surface formation for the Rye Patch Federal 24-21 is the Eocene Green River Formation. The predominately lacustrine and fluvial Green River Formation consists of fine to very fine grained sandstones and red to green mudstones, with lesser amounts of lacustrine limestones. No significant gas shows were recorded in the Green River Formation.

The non marine Wasatch Group (3,350 feet) consists predominately of light gray to reddish brown, poorly indurated silts, sands, and shales; often with minor carbonaceous stringers. The Wasatch Group of latest Cretaceous to Eocene is predominately fluvial to lacustrine, and unconformably overlies the Price River Formation of the Mesaverde Group. The gas during the upper Wasatch Group was consistently low and all methane.

The North Horn Formation of the Wasatch Group (5,500 feet) is of latest Cretaceous (Maastrichtian) to early Tertiary (Paleocene). The upper North Horn lacustrine shale sequence indicates inundation of this area by the early Tertiary Uinta Lake. The North Horn member consists of light gray to red brown to variegated shales, silts, and sands with lesser amounts of white to tan cryptocrystalline limestones. The highest show in the North Horn Formation was 544 units with a mud weight of 9.2 lbs/gal, which had the first significant appearance of heavier hydrocarbons (ethane & propane).

The uppermost formation in the Cretaceous Mesaverde Group is the Price River Formation (7,372 feet). The Price River Formation alluvial plain deposits include sediments that accumulated in braided and meandering streams, flood plains, and lacustrine environments. In the Rye Patch Federal 24-21 well, the Price River Formation consists of off white to light gray, fine to medium grained sands with abundant varicolored shales and silts, and minor lacustrine limestones.

The Castlegate Formation is predominately fluvial in origin, with only a minor marine component that unconformably overlies the Blackhawk Formation. The uppermost portion of the Cretaceous Castlegate Formation is the Bluecastle Member (9,200 feet). The Bluecastle Member accumulated in braided stream complexes and consists predominately of thick siliceous sandstones with lesser amounts of shales and silts. The sandstones of the Bluecastle Member become somewhat calcareous with depth, and several shows of up to 939 units were logged.



**Shale lamination at  
9450'-9460'**



The basal member of the Castlegate Formation is the Lower Castlegate Member (9,900 feet). The Lower Castlegate Member is another fluvial dominated sandstone interval and consists of massive, calcareous, fine grained sandstones grading into poorly sorted sands and finer sediments towards the base.

The depositional environment of the Cretaceous Blackhawk Formation is non marine to marginal marine. The uppermost portion of the Blackhawk Formation (10,100 feet) in the Rye Patch Federal 24-21 well consists of massive, very hard, siliceous sandstone. The Blackhawk Formation in this well contained several areas of coal. One exceptional area of coal was at 10,422 feet. There was a gas show of 3,846 units and a drilling break of roughly 6 feet.

The marine Cretaceous Mancos Formation (11,032 feet) in the Rye Patch Federal 24-21 well consisted predominately of gray siltstones and fine to very fine grained sandstones, with lesser amounts of shale. Background gas increased throughout the Mancos, and several significant gas shows were recorded. The most notable gas show was 9,656 units at 10,127 feet, which required the gas buster to be utilized for the remainder of the well.



**Flare at 10,127 feet**



**Flare at 10,127 feet**

The Rye Patch Federal 24-21 well should be a productive addition to Petro-Canada's holdings in the Uinta basin.

## WELL DATA

COMPANY NAME:	Petro-Canada Resources	
WELL NAME:	Rye Patch Federal 24-21	
COMPANY REPRESENTATIVE:	Jerry Outlaw and Kevin Carter	
SURFACE LOCATION:	<u>T-R-Sec, County, State</u> NE NW Sec 24, T11S, R14E, Duchesne County, Utah	<u>Spot Location</u> 606' FNL, 2144' FWL
BOTTOM-HOLE LOCATION:	Not available	FNL, FEL
LAT-LONG:	Latitude: 39.84859 Longitude: -110.29706	
API NUMBER:	43-013-33443-00	
FIELD:	Exploratory/Wildcat	
ELEVATION:	6969' GL, 6995' KB	
SPUD DATE:	8/18/2007	
DATE TD REACHED:	10/21/2007	
CONTRACTOR:	Nabors Rig #266	
TOOLPUSHER:	Logan Penhollow and Mark Munson	
DRILLERS:	Dale Herman, Chris Hibl, Preston McArthur, Preston Bryant, and Bill Bryant	
PUMPS:	#1 National, 12P-160 12" stroke #2 National, 12P-160 12" stroke	
HOLE SIZE:	8 3/4"	
CASING:	Surface: 9.625" to 1200' 9 5/8" to 1470'	
MUD COMPANY:	Mi SWACO	
ENGINEER:	Hayden Prescott and James Oldham	
PROGRAM:	Water/DAP/Gel/Chem	
WELLSITE GEOLOGY:	Entrada GeoSciences	
GEOLOGISTS:	Lisa Guttery and Paula Read	
LOGGING COMPANY:	Not applicable	
TOTAL DEPTH:	Driller: 15500'	
BOTTOM HOLE FORMATION:	Mancos (possible transition to Dakota Siltston zone)	
SAMPLE PROGRAM:	30' samples base surface casing 1480' to 5980' 20' samples 5980' to 7400' 10' samples 7400' to 11200' 20' samples 11200' to 15500'	
WELL STATUS:	Unstick drill string	



## DAILY CHRONOLOGY

Date	Midnight Depth	24 hr Footage	Activity
8/31/2007			Paula drives from Denver, CO to Grand Junction, CO
9/1/2007	1450		Lisa and Paula arrive on location and rig up. Wait on drill out.
9/2/2007	1994	544	Drill out at 16:10 at a depth of 1450'. Begin catching 30' samples. Drill 1450'-1994'.
9/3/2007	3843	1849	Change wash pipe. Drill 2094'-3843'.
9/4/2007	5328	1485	Drill 3843'-5328'.
9/5/2007	6055	727	Drill 5328'-5536'. Rig repairs, hook load recalibrated. Drill 5536'-6055'.
9/6/2007	6329	274	Drill 6055'-6228'. TOH for bit #2. TIH. Drill 6228'-6329'.
9/7/2007	6860	531	Drill 6329'-6860'.
9/8/2007	7244	384	Drill 6860'-7244'.
9/9/2007	7488	244	Drill 7244'-7488'. Begin mud up process. Circulate hole and mix pill. TOH for bit #3.
9/10/2007	7817	329	TIH. Drill 7488'-7817'.
9/11/2007	8346	529	Drill 7817'-8346'.
9/12/2007	8793	447	Drill 8346'-8793'.
9/13/2007	9043	250	Drill 8794'-9043'. Pump pill and TOH for bit #4.
9/14/2007	9143	100	TIH. Drill 9043'-9143'.
9/15/2007	9152	9	Drill 9143'-9148'. Pressure too high when bit is on bottom. TOH for bit #5. TIH. Drill 9148'-9152'.
9/16/2007	9234	82	Drill 9152'-9209'. Problem with torque. TOH. Pick up bit #6. TIH. Drill 9209'-9234'.
9/17/2007	9298	64	Drill 9234'-9298'. TOH for bit #7. TIH.
9/18/2007	9405	107	TIH. Drill 9298'-9405'. TOH for bit #8.
9/19/2007	9450	45	Finish TOH, pick up bit #8 and new mud motor. TIH. Drill 9405'-9450'.
9/20/2007	9590	140	Drill 9450'-9590'.
9/21/2007	9749	159	Drill 9590'-9749'.
9/22/2007	9855	106	Drill 9749'-9855'.
9/23/2007	9890	35	Drill 9855'-9883'. TOH for bit #9. TIH. Drill 9883'-9890'.
9/24/2007	10022	132	Drill 9890'-10022'. TOH for bit #10. TIH.
9/25/2007	10099	77	TIH. Drill 10022'-10099'. TOH for bit #11.
9/26/2007	10198	99	TIH. Drill 10099'-10198'.
9/27/2007	10410	212	Drill 10198'-10410'.
9/28/2007	10522	112	Drill 10410'-10438'. TOH for bit #12 due to low ROP. TIH. Drill 10438'-10522'.
9/29/2007	10595	73	Drill 10522'-10595'. TOH for bit #13. TIH.
9/30/2007	10844	249	TIH. Drill 10595'-10844'.

## DAILY CHRONOLOGY CONTINUED

Date	Midnight Depth	24 hr Footage	Activity
10/1/2007	10986	142	Drill 10844'-10986'. TOH for bit change and to test BOP.
10/2/2007	11283	297	BOP test good. TIH. Drill 10986'-11283'.
10/3/2007	11998	715	Drill 11283'-11998'.
10/4/2007	12598	600	Drill 11998'-12169'. 20'-25' flare at lag depth 12130' for ~2 hours. Gas buster started at 06:55. Diameter of flare line 8 inches. Venting through gas buster. Drill 12169'-12598'.
10/5/2007	12985	387	Drill 12598'-12685'. Top drive swivel packing leaking. TOH 5 stands. R2 swivel packing. TIH 5 stands. Drill 12685'-12985'. 8'-15' flare at 12685' for 20 minutes. Not venting through gas buster 12735'-12835'. Venting through gas buster from 12835'. Loss of returns/circulation at 12985'. Attempt to up mud weight to 11.0+.
10/6/2007	13255	270	Wait on LCM load. 10'-20' continuous flare throughout downtime. Add LCM to weight up mud. Start drilling at 14:00. Bypassing shakers. Drill 12985'-13255'. 5'-10' continuous flare with bursts up to 20' while drilling.
10/7/2007	13866	611	Drill 13255'-13866'. Continuing to bypass shakers. Continuous 5'-10' flare.
10/8/2007	14462	596	Drill 13866'-14462'. Continuing to bypass shakers. Continuous 5'-8' flare.
10/9/2007	14625	163	Drill 14462'-14625'. Continuing to bypass shakers. Stop drilling and circulate to weigh up mud in order to TOH for BOP change and rig repairs. Still have continuous 5'-8' flare with bursts up to 12'.
10/10/2007	14625	0	Continue to build up mud weight. Continue to circulate. Continue to bypass shakers. Stop circulation. TOH 11 stands, 30-45 units of gas. TIH. Start circulation. 3'-5' continuous flare. TOH. Lay down motor. Pull wear ring. P/U packer. TIH with D/P to 1270'. TOH.
10/11/2007	14625	0	Nipple down BOP. Cut off 5K lb well head. Weld on 10K lb well head. Test well head.
10/12/2007	14625	0	Nipple up BOP. Test BOP. Test fail (hydrill did not test)-door gaskets on top pipe leak. Install gasket in pipe ram, work on kill line and choke valves. Install flow line.
10/13/2007	14625	0	TIH with D/P to 1270'. TOH. Test BOP's. Fish for joint. Test choke valves. Trip in with retriever tool. Work on gas buster lines. Install ROT. TIH, circulate through packer to raise mud weight. Lost 131 bbls.
10/14/2007	14625	0	Pull packer. TOH. Lay down packer & tools. P/U bit, bit sub, TIH to shoe. Slip & cut 120'. Bit plugged, TOH. TIH.
10/15/2007	14649	24	TIH. Wash and ream. Stage in B/U at 7495'-14625'. Change agitator and riser. Drill 14625'-14649'. Continue venting through gas buster with continuous 4'-8' flare.

### DAILY CHRONOLOGY CONTINUED

Date	Midnight Depth	24 hr Footage	Activity
10/16/2007	15043	394	Drill 14649'-15043'. Continue venting through gas buster with continuous 5'-10' flare.
10/17/2007	15209	166	Drill 15043'-15209'.
10/18/2007	15262	53	Drill 15209'-15262'. TOH for bit change. TIH.
10/19/2007	15336	74	TIH. Drill 15262'-15336'.
10/20/2007	15449	113	Drill 15336'-15449'.
10/21/2007	15500	51	Drill 15449'-15500'. Short TOH.
10/22/2007	15500	0	TIH. Circulate. 4'-6' flares, bursts up to 30'. TOH for e-logs.
10/23/2007	15500	0	Attempt to run e-logs. Tool stuck at 2415'. TIH with old tricone bit to 4068'. Ream and pump. TOH. TIH with logging tools stuck at 2700' twice. TIH with drill string to TD.
10/24/2007	15500	0	TIH to TD. Circulate. Flare bursts 20'-30'.
10/25/2007	15500	0	Continue to circulate. Weight up mud. Intermittant flares 3'-5'. TOH to shoe.
10/26/2007	15500	0	Entrada GeoSciences released by Petro-Canada at 09:00. Rigged down equipment. Paula leaves for Grand Junction, CO.

### BIT RECORD

#	MAKE	TYPE	SIZE	DEPTH IN	DEPTH OUT	FOOTAGE	HOURS RUN
1	United Diamond	UD516 B	8 3/4"	1441	6228	4787	84
2	United Diamond	UD516 B	8 3/4"	6228	7488	1260	64
3	United Diamond	UD513 B	8 3/4"	7488	9043	1555	83.5
4	United Diamond	UD513 B	8 3/4"	9043	9148	105	12
5	Smith	F59Y	8 3/4"	9148	9209	61	11.5
6	Smith	F59Y	8 3/4"	9209	9298	89	18.5
7	Smith	F59Y	8 3/4"	9298	9405	107	21
8	Smith	K703	8 3/4"	9405	9883	478	86.5
9	Smith	F67Y	8 3/4"	9883	10022	139	17
10	Smith	F67Y	8 3/4"	10022	10099	77	17
11	Smith	F47Y	8 3/4"	10099	10438	339	43
12	Hughes	HC506ZX	8 3/4"	10438	10595	157	21
13	Hughes	HC506Z	8 3/4"	10595	10986	391	39.5
14	Hughes	HC506ZX	8 3/4"	10986	14625	3639	133.5
15	Hughes	HC506Z	8 3/4"	14625	15262	637	58
16	STC	MS1616	8 3/4"	15262	15500	238	37

# MUD RECORD

DATE	DEPTH	WT	VIS	WL	SOL%	Ph	Chlorides
9/3/2007	2515	8.6	27			7.8	600
9/4/2007	4317	8.8	27			7.7	600
9/5/2007	5616	9.3	28			7.9	600
9/6/2007	6215	9.2	28			7.8	600
9/7/2007	6519	9.3	29			7.8	600
9/8/2007	7007	9.2	28			7.8	600
9/9/2007	7383	9.2	28			7.8	800
9/10/2007	7555	9.4	28			7.8	800
9/11/2007	7997	9.5	29		6.0	7.6	800
9/12/2007	8541	9.5	36		6.0	7.6	800
9/13/2007	8936	9.5	37		6.0	7.7	500
9/14/2007	9043	9.5	47		6.0	7.7	500
9/15/2007	9118	9.6	37		6.0	7.5	700
9/16/2007	9209	9.5	37		6.0	7.3	700
9/17/2007	9276	9.5	40		5.0	7.6	800
9/18/2007	9329	9.5	37		5.0	7.7	700
9/19/2007	9405	9.6	45		5.0	7.5	600
9/20/2007	9491	9.6	36		5.0	7.6	600
9/21/2007	9640	9.5	36		5.0	7.7	800
9/22/2007	9796	9.5	35		4.0	7.5	800
9/23/2007	9879	9.6	40		4.0	7.8	800
9/24/2007	9955	9.6	38		5.0	7.6	700
9/25/2007	10052	9.6	39		5.0	7.7	800
9/26/2007	10099	9.8	38		5.0	7.8	800
9/27/2007	10262	9.7	37		5.0	7.7	800
9/28/2007	10438	9.7	38		6.0	7.7	800
9/29/2007	10562	9.7	36		6.0	7.4	800
9/30/2007	10672	9.7	37		5.0	7.4	800
10/1/2007	10879	9.7	39		6.0	7.7	3.2
10/2/2007	10986	9.8	39		6.0	7.7	800
10/3/2007	11486	10.0	40		7.0	7.7	900
10/4/2007	12183	10.2	40		8.0	7.7	900
10/5/2007	12738	10.4	40		9.0	7.7	900
10/6/2007	12985	10.5	44		9.0	7.7	900
10/7/2007	13446	10.3	53		9.0	7.7	900
10/8/2007	14035	10.6	51		10.0	7.7	900
10/9/2007	14625	11.5	64		13.0	7.4	900
10/10/2007	14625	13.4	95		20.0	7.5	900
10/11/2007	14625	13.5	90		20.0	7.5	900
10/12/2007	14625	11.0	35		10.0	7.6	800
10/13/2007	14625	11.1	38		10.0	7.5	700
10/14/2007	14625	12.1	40		10.0	7.3	800
10/15/2007	14625	12.4	40		10.0	7.4	800
10/16/2007	14750	12.1	39		20.0	7.5	800
10/17/2007	15096	12.1	41		20.0	7.7	900
10/18/2007	15251	12.2	40		15.0	7.7	800
10/19/2007	15269	12.1	41		17.0	7.5	800
10/20/2007	15380	12.3	42		17.0	7.7	800
10/21/2007	15476	12.3	41		16.0	7.6	800
10/22/2007	15500	12.3	41		16.0	7.5	800

### DEVIATION SURVEYS

Depth	Angle	Depth	Angle
1995	1.0	8821	1.0
2060	1.0	9164	3.0
2489	1.0	9709	2.0
3486	2.0	10246	1.0
3963	4.0	10700	1.0
4588	3.0	11420	3.0
5104	4.0	11708	3.0
5485	3.0	12146	2.0
5960	2.0	12336	2.0
6446	2.0	12560	2.0
6950	1.0	12906	3.0
7443	1.0	13096	3.0
7873	2.0	13350	3.0
8348	2.0	13795	3.0

## FORMATION TOPS

Measured from KB elevation: 6995 feet

### FORMATION TOPS:

Formation.	Sample Top (ft)	Subsea (ft)	Predicted Tops	Original Prognosis	Drill Interval to Next Top
Green River	0	6995	0	0	3350
Wasatch	3350	3645	3350	3350	2150
North Horn	5500	1495	5500	5500	1850
U. Price River	7372	-377	7372	7350	1850
Bluecastle	9200	-2205	9200	9200	750
Castlegate	9900	-2905	9900	9950	250
Blackhawk	10100	-3105	10100	10200	700
Mancos transition	10920	-3925	10920	10900	2100
Mancos	11032	-4037	11032	10900	2100
Dakota	UND	UND	15000	15000	-2000
TD	15500	-8505	15500	13000	

## INDIVIDUAL SAMPLE DESCRIPTIONS

Sample descriptions by  
Lisa Guttery and Paula Read

- 1480-1510 Sandstone white to translucent, very fine grained, well sorted, sub rounded to rounded, consolidated, moderately hard, non calcareous, fair porosity, no stain, fluorescence, or cut
- 1510-1540 Sandstone white to translucent to green, occasional light gray, rare brown, very fine grained, well sorted, sub rounded to rounded, consolidated, moderately hard, calcareous, fair porosity, no stain, fluorescence, or cut
- 1540-1570 Sandstone green to white to translucent, occasional light gray, very fine grained, well sorted, sub rounded to rounded, consolidated, moderately hard, calcareous, fair porosity, no stain, fluorescence, or cut
- 1570-1600 Sandstone white to translucent, occasional light gray, rare green, very fine grained, well sorted, sub rounded to rounded, consolidated, moderately hard, calcareous, fair porosity, abundant pyrite, no stain, fluorescence, or cut
- 1600-1630 Sandstone white to translucent, occasional light gray, rare green to brown, very fine grained, well sorted, sub rounded to sub angular, unconsolidated, calcareous, fine to good porosity, some pyrite, no stain, fluorescence, or cut
- 1630-1660 Sandstone green to white to gray to translucent, very fine grained, well sorted, sub rounded to rounded, consolidated, moderately hard, calcareous, fair porosity, some pyrite, no stain, fluorescence, or cut
- 1660-1690 Sandstone white to translucent, very fine grained, well sorted, sub angular, unconsolidated, calcareous, fine to good porosity, abundant pyrite, no stain, fluorescence, or cut
- 1690-1720 Sandstone white to translucent, occasional green to gray, very fine to fine grained, well sorted, sub rounded, consolidated, moderately hard, calcareous, fair porosity, occasional pyrite, no stain, fluorescence, or cut
- 1720-1750 Sandstone green to translucent to white, occasional gray, very fine grained, well sorted, sub rounded, consolidated, moderately hard, calcareous, fair porosity, occasional pyrite, no stain, fluorescence, or cut
- 1750-1780 Sandstone green to translucent to white to light brown, fine to very fine grained, sub angular to sub rounded, occasional limestone clear quartz, well sorted, moderately consolidated, moderately hard, calcareous, fair porosity, occasional pyrite, rare siltstone red to brown, slight mineral fluorescence, no stain or cut
- 1780-1810 Sandstone green to translucent to white to light brown, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, well sorted, moderately consolidated, moderately hard, calcareous, fair porosity, limestone, white, fine to sandy texture, hard, oolitic in part, rare siltstone red to brown to gray, slight mineral fluorescence, no stain or cut
- 1810-1840 Sandstone green to translucent to white, very fine grained, sub rounded, well sorted, consolidated, hard, calcareous, fair porosity, trace pyrite, trace limestone white, fine texture, hard, rare siltstone brown to gray, rare shale gray, no stain, fluorescence, or cut



- 1840-1870 Sandstone green to translucent to white, very fine grained, sub rounded, well sorted, consolidated, hard, calcareous, fair porosity, trace siltstone red to brown to gray, sandy in part, trace shale gray to green, blocky, abundant fluorescence, milky cut, stain
- 1870-1900 Sandstone green to translucent to white, trace gray, very fine grained, sub rounded, well sorted, consolidated, hard, calcareous, fair porosity, siltstone red to brown, sub platy to sub blocky, laminated in part, sandy, moderately firm, trace shale gray, sandy in part, trace mineral fluorescence, slow milky cut, slight stain
- 1900-1930 Sandstone green to translucent to white, salt and pepper in part, very fine grained, sub rounded, well sorted, consolidated, hard, slightly calcareous, fair porosity, siltstone red to brown, sub platy to sub blocky, sandy, moderately firm, trace shale gray, sandy in part, trace mineral fluorescence, no stain or cut
- 1930-1960 Sandstone green to translucent to white, salt and pepper in part, fine to very fine grained, some limestone quartz grains, sub angular to sub rounded, well sorted, consolidated, hard, slightly calcareous, fair porosity, siltstone red to brown, trace gray, sub platy to sub blocky, sandy, moderately firm, trace shale gray to green, sandy in part, no stain, fluorescence, or cut
- 1960-1990 Sandstone green to translucent to white, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, well sorted, consolidated, hard, slightly calcareous, fair porosity, siltstone gray to green, trace red to brown, sub platy to sub blocky, sandy, hard, trace shale gray, sub blocky, sandy in part, slight mineral fluorescence, no stain or cut
- 1990-2020 Sandstone green to translucent to white, slightly salt and pepper, very fine grained, sub rounded, well sorted, consolidated, hard, slightly calcareous, fair porosity, siltstone gray to green, trace red to brown, sub platy to sub blocky, sandy, hard, trace shale gray, bright green in part, sub blocky, sandy in part, slight mineral fluorescence, no stain or cut
- 2020-2050 Sandstone translucent to white to light brown, slightly salt and pepper, very fine grained, sub rounded, well sorted, consolidated, hard, slightly calcareous, fair porosity, shale gray to green, sub platy to sub blocky, sandy in part, moderately firm, trace siltstone red to brown, sub platy, mineral fluorescence, abundant milky cut, stain
- 2050-2080 Sandstone translucent to white to light brown, fine to very fine grained, some limestone quartz grains, sub angular to sub rounded, moderately sorted, moderately consolidated, hard, calcareous, fair porosity, trace pyrite, trace shale gray to green, sub platy, sandy in part, moderately firm, trace siltstone red to brown, sub platy, mineral fluorescence, abundant milky cut, stain
- 2080-2110 Sandstone green to translucent to white to brown, fine to very fine grained, sub angular to sub rounded, moderately sorted, moderately consolidated, hard, calcareous, fair porosity, trace pyrite, trace shale green, sub platy, sandy in part, moderately firm, trace siltstone brown, sub platy, mineral fluorescence, slow milky cut, no stain
- 2110-2140 Sandstone translucent to white, medium to fine grained, sub angular to sub rounded, some limestone quartz grains, poorly sorted, poorly consolidated, hard, calcareous, fair porosity, occasional pyrite, shale green, sub platy, sandy in part, moderately hard, slight mineral fluorescence, abundant milky cut, stain
- 2140-2170 Sandstone translucent to white, very fine grained, sub rounded, well sorted, moderately consolidated, hard, calcareous, fair porosity, trace pyrite, shale green to light gray, sub platy to sub blocky, moderately hard, siltstone red to brown, sub platy, sandy, hard, slight mineral fluorescence, slow milky cut, no stain

- 2170-2200 Sandstone translucent to white, very fine grained, sub rounded, well sorted, moderately consolidated, hard, calcareous, fair porosity, trace pyrite, shale green to light gray, sub platy to sub blocky, moderately hard, sandy in part, siltstone red to brown, sub platy, hard, slight mineral fluorescence, slow milky cut, no stain
- 1200-2230 Sandstone translucent to white, fine to very fine grained, sub angular to sub rounded, moderately sorted, poorly consolidated, hard, calcareous, fair porosity, trace pyrite, trace shale green, sub platy, moderately hard, trace siltstone red to brown, sub platy, hard, slight mineral fluorescence, slow milky cut, slightly stain
- 2230-2260 Sandstone translucent to white, medium to fine grained, some very fine grained, abundant limestone quartz grains, sub angular to sub rounded, poorly sorted, poorly consolidated, hard, calcareous, fair porosity, trace pyrite, trace shale grain, sub platy, moderately hard, trace siltstone red to brown, sub platy, hard, slight mineral fluorescence, slow milky cut, no stain
- 2260-2290 Shale light gray to brown to dark brown, sub platy to sub blocky, sandy in part, hard, occasional sandstone translucent to white, very fine grained, sub rounded, well sorted, moderately consolidated, calcareous, fair porosity, trace pyrite, slight mineral fluorescence, no stain or cut
- 2290-2320 Shale tan to brown, sub platy to sub blocky, sandy in part, moderately hard to hard, trace sandstone translucent to white to tan, very fine grained, sub rounded, poorly consolidated, slightly calcareous, trace siltstone tan to green, sub platy, slight mineral fluorescence, no stain or cut
- 2320-2350 Shale tan to brown to dark brown, sub platy to sub blocky, sandy in part, moderately hard to hard, trace sandstone translucent to white to tan, very fine grained, sub rounded, poorly consolidated, slightly calcareous, trace siltstone tan to green, sub platy, slight mineral fluorescence, slightly milky cut, no stain
- 2350-2380 Shale tan to brown to gray to green, sub platy to sub blocky, sandy in part, moderately hard to hard, trace sandstone gray to white, very fine grained, sub rounded, poorly consolidated, slightly calcareous, trace siltstone tan to green, sub platy, trace pyrite, slight mineral fluorescence, slight milky cut, no stain
- 2380-2410 Sandstone white to translucent to gray, rare brown, fine to very fine grained, well sorted, sub rounded to sub angular, consolidated, moderately hard, calcareous, fair porosity, no stain, fluorescence, or cut
- 2410-2440 Sandstone light to medium gray to translucent, occasional white, very fine to fine grained, very well to well sorted, sub rounded, consolidated, moderately hard, very calcareous, fair porosity, no stain, fluorescence, or cut
- 2440-2470 Sandstone light to medium gray to translucent, occasional white, very fine to fine grained, very well to well sorted, sub rounded, consolidated, moderately hard, very calcareous, fair porosity, rare shale dark gray to black, platy, moderately firm, sandy in part, no stain, fluorescence, or cut
- 2470-2500 Sandstone light to medium gray to translucent, some white, fine to very fine grained, very well to well sorted, sub rounded to rounded, consolidated, moderately hard, very calcareous, fine to poor porosity, occasional oolites, no stain, fluorescence, or cut
- 2500-2530 Sandstone white to tan to light brown to translucent, fine to very fine grained, well sorted, sub rounded to sub angular, consolidated, moderately firm, very calcareous, fair porosity, trace shale white to tan to light brown, platy to flaky, soft, sandy in part, no stain, fluorescence, or cut
- 2530-2560 Sandstone white to translucent to buff, occasional light brown, fine to very fine grained, well sorted, sub rounded, consolidated, moderately hard to hard, very calcareous, fair porosity, some pyrite, good trace shale light gray to brown, platy, soft, sandy in part, no stain, fluorescence, or

cut

- 2560-2590 Shale light to medium brown, occasional light to medium gray, platy to flaky to sub blocky, moderately soft to firm, sandy in part, calcareous, spotty bright yellow fluorescence, very slow streaming yellow cut
- 2590-2620 Sandstone light gray to translucent to white, occasional buff to brown, fine to very fine grained, well sorted, sub rounded, consolidated, moderately hard, very calcareous, fair porosity, occasional pyrite, occasional shale gray, platy, soft, calcareous, no stain, fluorescence, or cut
- 2620-2650 Sandstone light gray to translucent, occasional white to brown, fine to very fine grained, well sorted, sub rounded to sub angular, consolidated, moderately hard, very calcareous, fine to moderate porosity, abundant pyrite, occasional shale gray, platy, soft, calcareous, no stain, fluorescence, or cut
- 2650-2680 Sandstone light gray to translucent, very fine grained, well sorted, sub rounded, consolidated, moderately hard, calcareous, fine to good porosity, some siltstone reddish brown, moderately soft, slightly calcareous, rare dull orange mineral fluorescence, no stain or cut
- 2680-2710 Sandstone light gray to translucent, occasional white, very fine grained, well sorted, sub rounded, consolidated, moderately hard, calcareous, fine to good porosity, some siltstone reddish brown, moderately soft, slightly calcareous, rare dull orange mineral fluorescence, no stain or cut
- 2710-2740 Sandstone translucent, fine grained, angular to sub angular, unconsolidated, non calcareous, predominantly clean, trace siltstone dark gray to brown, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut
- 2740-2770 Sandstone light gray to translucent, occasional white, fine to very fine grained, well sorted, sub rounded to sub angular, consolidated, moderately hard, very calcareous, fair porosity, abundant siltstone brown to reddish brown, moderately soft, calcareous, no stain, fluorescence, or cut
- 2770-2800 Sandstone translucent to gray, fine grained, angular to sub angular, consolidated to friable, non calcareous, predominant clean, trace siltstone brown to reddish brown, occasional gray, moderately soft, calcareous, occasional pyrite, no stain, fluorescence, or cut
- 2800-2830 Sandstone translucent to gray to white, fine grained, angular to sub angular, consolidated, moderately hard, non calcareous, some siltstone brown to reddish brown, rare white, occasional gray, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut
- 2830-2860 Sandstone translucent to light gray, fine grained, angular to sub angular, consolidated, moderately hard, non calcareous, some siltstone light brown to reddish brown, trace white, occasional gray, moderately soft, calcareous, no stain, fluorescence, or cut
- 2860-2890 Sandstone translucent to white, fine grained, angular to sub angular, consolidated, moderately hard, non calcareous, abundant siltstone light brown to reddish brown, trace white to light gray to tan, moderately soft, calcareous, no stain, fluorescence, or cut
- 2890-2920 Siltstone reddish brown to brown, rare light gray, platy to flaky to sub blocky, soft, calcareous, no stain, fluorescence, or cut
- 2920-2950 Sandstone translucent to gray, fine to very fine grained, angular to sub angular, consolidated, moderately hard, non calcareous, some siltstone brown to reddish brown, rare white, occasional gray, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut
- 2950-2980 Sandstone translucent to gray to white, fine grained, angular to sub angular, consolidated, moderately hard, non calcareous, abundant siltstone brown to reddish brown, rare white,

occasional gray, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut

- 2980-3010 Sandstone translucent to light gray to white, fine to very fine grained, sub rounded to sub angular, consolidated, moderately hard, calcareous, occasional siltstone light gray, moderately soft, calcareous, no stain, fluorescence, or cut
- 3010-3040 Sandstone translucent to light gray to white, fine to very fine grained, sub rounded to sub angular, consolidated, moderately hard, calcareous, abundant siltstone light gray, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut
- 3040-3070 Siltstone medium to dark brown, occasional light brown, sub platy to blocky, moderately soft, very calcareous, occasional shale light gray, sub blocky to platy, soft, slightly calcareous, trace sandstone a/a, rare white chert, no stain, fluorescence, or cut
- 3070-3100 Siltstone medium to dark brown, occasional light brown to light gray, sub platy to blocky, moderately soft, very calcareous, some limestone brown, coarse crystalline, argillaceous, oolitic, spotty bright yellow fluorescence, very slow streaming yellow cut
- 3100-3130 Siltstone light to medium brown, occasional dark brown to gray, sub platy to blocky, moderately soft, very calcareous, trace pyrite lamination, some limestone brown to gray, coarse crystalline, argillaceous, spotty bright yellow fluorescence, very slow streaming yellow cut
- 3130-3160 Siltstone light to medium gray, occasional brown, sub platy to sub blocky, moderately soft to firm, calcareous, some limestone brown to gray, coarse crystalline, argillaceous, some sandstone translucent to white, fine to very fine grained, sub rounded, consolidated, moderately hard, calcareous, occasional pyrite, abundant dull orange fluorescence, no stain or cut
- 3160-3190 Sandstone translucent to white to gray, occasional light brown, fine to medium grained, angular to sub angular, poorly sorted, consolidated, moderately hard, fair porosity, very calcareous, abundant siltstone a/a, occasional pyrite, trace dull orange fluorescence, no stain or cut
- 3190-3220 Sandstone translucent to white to gray, occasional light brown, fine to medium grained, angular to sub angular, poorly sorted, consolidated, moderately hard, fair porosity, very calcareous, some siltstone a/a, occasional pyrite, trace dull orange fluorescence, no stain or cut
- 3220-3250 Sandstone gray to translucent, occasional white to light brown, fine to very fine grained, sub rounded to sub angular, well sorted, consolidated, moderately hard, fair porosity, very calcareous, trace siltstone light gray to white to brown, sub platy, moderately soft, calcareous, some pyrite, trace dull orange fluorescence, no stain or cut
- 3250-3280 Sandstone translucent to gray, rare white, fine to very fine grained, rounded to sub rounded, well sorted, consolidated, moderately hard, fair porosity, very calcareous, occasional siltstone reddish brown to gray, platy to sub blocky, moderately soft, calcareous, some pyrite, rare dull orange mineral fluorescence, no stain or cut
- 3280-3310 Sandstone translucent to white, fine grained, angular to sub angular, poorly sorted, unconsolidated to consolidated, fine to good porosity, calcareous, occasional siltstone reddish brown to gray, rare tan, sub blocky to blocky, moderately soft, calcareous, trace pyrite, no stain, fluorescence, or cut
- 3310-3340 Siltstone reddish brown to gray, sub platy to sub blocky, moderately soft to firm, calcareous, occasional sandstone a/a, trace shale brown to gray to off white, platy to sub platy, soft, slightly calcareous, silty, abundant dull orange fluorescence, no stain or cut
- 3340-3370 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, rare sandstone a/a, no stain, fluorescence, or cut

- 3370-3400 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, trace sandstone translucent to white, salt and pepper in part, very fine grained, sub rounded, well sorted, trace shale gray, sub blocky, sandy in part, no stain, fluorescence, or cut
- 3400-3430 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, trace sandstone a/a, trace shale gray to green, sub blocky, sandy in part, no stain, fluorescence, or cut
- 3430-3460 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, occasional shale gray to green, sub blocky, sandy in part, rare sandstone a/a, no stain, fluorescence, or cut
- 3460-3490 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, occasional shale gray to green, sub blocky, sandy in part, trace sandstone translucent to white to gray, salt and pepper in part, very fine grained, sub angular to sub rounded, poorly consolidated, trace pyrite, no stain, fluorescence, or cut
- 3490-3520 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, mudstone in part, occasional shale gray to green, sub blocky, sub waxy, sandy in part, rare sandstone a/a, no stain, fluorescence, or cut
- 3520-3550 Siltstone reddish brown, sub platy, moderately soft to firm, very calcareous, mudstone in part, occasional shale gray to green, sub blocky, sub waxy, sandy in part, trace sandstone a/a, trace pyrite, no stain, fluorescence, or cut
- 3550-3580 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, abundant mudstone, occasional shale gray to green, sub platy to sub blocky, sandy in part, waxy, rare sandstone translucent to white to gray, salt and pepper in part, very fine grained, sub angular to sub rounded, well consolidated, no stain, fluorescence, or cut
- 3580-3610 Siltstone reddish brown, yellow in part, sub platy to sub blocky, moderately soft to firm, very calcareous, abundant mudstone, occasional sandstone translucent to white to light red, salt and pepper in part, very fine grained, sub angular to sub rounded, well consolidated, trace shale gray to green, sub platy, no stain, fluorescence, or cut
- 3610-3640 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, abundant mudstone, slight trace shale gray to green, sub blocky, sandy in part, rare sandstone a/a, no stain, fluorescence, or cut
- 3640-3670 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, abundant mudstone, trace shale light gray to green, sub blocky, sandy in part, rare sandstone a/a, trace pyrite inclusion, no stain, fluorescence, or cut
- 3670-3700 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, abundant mudstone, trace shale light gray to green, sub platy, rare sandstone a/a, trace glauconite, no stain, fluorescence, or cut
- 3700-3730 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, some mudstone, trace shale light gray to green, sub platy, trace sandstone white to gray to light red, salt and pepper, very fine grained, sub angular to sub rounded, moderately consolidated, moderately sorted, calcareous, no stain, fluorescence, or cut
- 3730-3760 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, calcareous, some mudstone, occasional shale variegated to green, sub blocky to sub platy, hard, sandy in part, occasional sandstone white to gray to light red, salt and pepper, very fine grained, sub angular to sub rounded, moderately consolidated, moderately sorted, calcareous, no stain, fluorescence, or cut

- 3760-3790 Siltstone reddish brown, sub platy to sub blocky, moderately soft to firm, calcareous, some mudstone, occasional sandstone white to gray to light red to salt and pepper, very fine grained, occasional medium to fine grained, sub angular to sub rounded, moderately consolidated, moderately to poorly sorted, calcareous, trace shale gray to green, sub platy, moderately hard, trace chert, no stain, fluorescence, or cut
- 3790-3820 Sandstone translucent to white to light red, fine to very fine grained, abundant coarse crystalline limestone translucent quartz, angular to sub rounded, moderately to poorly consolidated, moderately firm, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 3820-3850 Siltstone brown to gray, sub platy to sub blocky, firm, sandy, calcareous, abundant reddish to brown mudstone, abundant sandstone white to gray to light red to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, moderately to poorly sorted, calcareous, trace shale gray to green, sub platy, moderately hard, no stain, fluorescence, or cut
- 3850-3880 Siltstone brown to gray, sub platy to sub blocky, firm, sandy, calcareous, abundant reddish to brown mudstone, occasional sandstone white to gray to light red, salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, moderately to poorly sorted, calcareous, trace shale gray to green, sub platy, moderately hard, trace glauconite, trace chert, no stain, fluorescence, or cut
- 3880-3910 Siltstone reddish brown, sub platy to sub blocky, hard, very calcareous, sandy, some mudstone, moderately soft, occasional sandstone translucent to white to green, salt and pepper in part, very fine grained, angular to sub rounded, consolidated, poorly sorted, very calcareous, trace shale gray to green, sub platy, moderately hard, slight mineral fluorescence, no stain, fluorescence, or cut
- 3910-3940 Siltstone reddish brown, sub platy to sub blocky, hard, very calcareous, sandy, some mudstone, moderately soft, slightly trace sandstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 3940-3970 Siltstone reddish brown, sub platy to sub blocky, hard, very calcareous, sandy, some mudstone, moderately soft, trace sandstone a/a, trace shale a/a, slight mineral fluorescence, no stain or cut
- 3970-4000 Siltstone reddish brown, sub platy to sub blocky, hard, very calcareous, sandy, some mudstone, moderately soft, occasional shale variegated to gray to green, sub platy, moderately hard, trace sandstone a/a, slight mineral fluorescence, no stain or cut
- 4000-4030 Siltstone brown to gray, sub platy to sub blocky, firm, sandy, calcareous, abundant reddish to brown mudstone, occasional sandstone tan to light brown, salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated, poorly sorted, slightly calcareous, trace shale gray to green, sub platy, moderately hard, no stain, fluorescence, or cut
- 4030-4060 Sandstone translucent to white to tan, salt and pepper in part, medium to fine grained, abundant limestone clear quartz, sub angular to sub rounded, poorly consolidated, poorly sorted, calcareous, occasional siltstone brown to reddish brown, sub platy, firm, mudstone in part, trace shale variegated, sub blocky, no stain, fluorescence, or cut
- 4060-4090 Siltstone brown to reddish brown, sub platy, hard, abundant mudstone, occasional sandstone a/a, slight trace shale a/a, trace pyrite, no stain, fluorescence, or cut
- 4090-4120 Mudstone reddish to brown, sub platy, soft, siltstone brown to reddish to brown, sub platy, hard, sandy, trace shale gray to green, sub platy, firm, no stain, fluorescence, or cut
- 4120-4150 Mudstone reddish to brown, sub platy, soft, siltstone brown to reddish to brown, sub platy, hard, sandy, trace shale variegated to gray to green, sub platy, firm, rare sandstone a/a, no stain,

fluorescence, or cut

4150-4180 Sandstone translucent to white to tan, salt and pepper in part, medium to fine grained, abundant limestone clear quartz, sub angular to sub rounded, poorly consolidated, poorly sorted, calcareous, occasional siltstone, brown to reddish brown, sub platy, firm, mudstone in part, trace shale, variegated, sub blocky, no stain, fluorescence, or cut

4180-4210 Sandstone translucent to white to light gray, salt and pepper in part, fine to medium grained, poorly sorted, sub rounded to angular, consolidated to friable to unconsolidated, moderately firm, slightly calcareous, fair porosity, some siltstone reddish brown to brown, occasional light gray to gray, sub platy to sub blocky, moderately firm, rare pyrite, no stain, fluorescence, or cut

4210-4240 Sandstone translucent to white to light gray, salt and pepper in part, fine to medium grained, poorly sorted, sub rounded to angular, consolidated to friable to unconsolidated, moderately firm, slightly calcareous, fair porosity, some siltstone reddish brown to brown, rare green, occasional light gray to gray, sub platy to sub blocky, moderately firm, rare pyrite, no stain, fluorescence, or cut

4240-4270 Sandstone translucent to white to light gray, some red, fine to medium grained, poorly sorted, sub rounded to angular, consolidated to friable to unconsolidated, moderately firm, calcareous, fair porosity, some siltstone reddish brown to brown, occasional light gray to gray, sub platy to sub blocky, moderately firm, rare pyrite, no stain, fluorescence, or cut

4270-4300 Siltstone reddish brown to gray, platy to sub platy, moderately soft to firm, calcareous, some mudstone reddish brown to gray, sub platy, soft, trace shale light gray to brown, platy, soft, no stain, fluorescence, or cut

4300-4330 Sandstone translucent to white, salt and pepper in part, fine to medium grained, poorly sorted, sub rounded to angular, unconsolidated, rare consolidated, very slightly calcareous, fine to good porosity, good trace siltstone reddish brown to brown, occasional light gray to gray, sub platy to sub blocky, moderately firm, no stain, fluorescence, or cut

4330-4360 Siltstone reddish brown, platy to sub platy to sub blocky, moderately soft to firm, calcareous, some sandstone a/a, trace shale reddish brown to light gray, platy, soft, rare limestone gray, coarse crystalline, argillaceous, no stain, fluorescence, or cut

4360-4390 Siltstone red to reddish brown, platy to sub platy to sub blocky, moderately soft to firm, calcareous, some sandstone translucent to red, fine grained, poor to moderately sorted, sub rounded to sub angular, consolidated, moderately firm, occasional mudstone reddish brown to gray, sub platy, soft, no stain, fluorescence, or cut

4390-4420 Siltstone reddish brown to light gray, platy to sub platy to sub blocky, moderately soft to firm, calcareous, some sandstone translucent to light gray, fine grained, poor to moderately sorted, sub rounded to sub angular, consolidated, moderately firm, occasional mudstone reddish brown to gray, sub platy, soft, no stain, fluorescence, or cut

4420-4450 Siltstone reddish brown to gray to green, platy to sub platy to sub blocky, moderately soft to firm, calcareous, some sandstone translucent to red, fine grained, poor to moderately sorted, sub rounded to sub angular, consolidated, moderately firm, occasional mudstone reddish brown to gray, sub platy, soft, no stain, fluorescence, or cut

4450-4480 Siltstone reddish brown to gray to green, platy to sub platy to sub blocky, moderately soft to firm, calcareous, some sandstone translucent to red, fine grained, poorly to moderately sorted, sub rounded to sub angular, consolidated, moderately firm, occasional mudstone reddish brown to gray, sub platy, soft, no stain, fluorescence, or cut

- 4480-4510 Sandstone translucent to light gray to white, some salt and pepper, fine grained, sub rounded to sub angular, unconsolidated, very calcareous, abundant siltstone tan to brown to gray to red, platy to sub blocky, moderately soft, calcareous, trace pyrite, rare dull orange mineral fluorescence, no stain or cut
- 4510-4540 Siltstone brown to reddish brown to gray, occasional tan, platy to sub blocky, moderately soft to firm, very calcareous, some sandstone salt and pepper to translucent to gray, fine to medium grained, sub rounded to sub angular, unconsolidated to consolidated to friable, calcareous, no stain, fluorescence, or cut
- 4540-4570 Sandstone translucent to light gray, occasional white, some salt and pepper, fine grained, sub rounded to sub angular, unconsolidated to consolidated to friable, very calcareous, abundant siltstone reddish brown to brown to gray, platy to sub blocky, moderately soft, calcareous, rare dull orange mineral fluorescence, no stain or cut
- 4570-4600 Siltstone brown to reddish brown to gray, occasional tan, rare yellow to tan, platy to sub blocky, moderately soft to firm, very calcareous, occasional sandstone salt and pepper to translucent to gray, fine to medium grained, sub rounded to sub angular, unconsolidated to consolidated to friable, calcareous, occasional mudstone reddish brown, sub platy, soft, no stain, fluorescence, or cut
- 4600-4630 Sandstone translucent to red, some salt and pepper, fine to medium grained, sub rounded to sub angular, unconsolidated to consolidated to friable, very calcareous, abundant siltstone reddish brown to brown to gray, platy to sub blocky, moderately soft, calcareous, occasional mudstone reddish brown, sub platy, soft, no stain, fluorescence, or cut
- 4630-4660 Siltstone reddish brown, occasional gray, sub blocky to sub platy, moderately soft to firm, very calcareous, occasional sandstone translucent to reddish brown, occasional salt and pepper, fine to medium grained, angular to sub angular, unconsolidated to consolidated to friable, calcareous, no stain, fluorescence, or cut
- 4660-4690 Sandstone translucent to white to salt and pepper, fine to medium grained, sub rounded to sub angular, unconsolidated, fine to good porosity, very calcareous, some siltstone brown to gray, rare off white to green, sub blocky to sub platy, moderately soft, calcareous, trace glauconite, no stain, fluorescence, or cut
- 4690-4720 Sandstone translucent to white to salt and pepper, fine to medium grained, sub rounded to sub angular, unconsolidated, fine to good porosity, very calcareous, abundant siltstone brown to gray, rare off white to green, sub blocky to sub platy, moderately soft, calcareous, trace glauconite, no stain, fluorescence, or cut
- 4720-4750 Sandstone translucent to white to salt and pepper, fine to medium grained, sub rounded to sub angular, unconsolidated, fine to good porosity, slightly calcareous, good trace siltstone brown to gray, rare off white to green, sub blocky to sub platy, moderately soft, calcareous, trace glauconite, no stain, fluorescence, or cut
- 4750-4780 Siltstone reddish brown, occasional gray, sub blocky to sub platy, moderately soft to firm, very calcareous, occasional sandstone translucent to reddish brown, occasional salt and pepper, fine to medium grained, angular to sub angular, unconsolidated to consolidated to friable, calcareous, no stain, fluorescence, or cut
- 4780-4810 Siltstone reddish brown, occasional gray, sub blocky to sub platy, moderately soft to firm, very calcareous, occasional sandstone translucent to reddish brown, occasional salt and pepper, fine to medium grained, angular to sub angular, unconsolidated to consolidated to friable, calcareous, no stain, fluorescence, or cut



- 4810-4840 Siltstone reddish brown to brown, occasional gray, sub blocky to sub platy, moderately soft to firm, calcareous, abundant sandstone translucent to white to gray, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, no stain, fluorescence, or cut
- 4840-4870 Siltstone reddish brown, occasional gray, sub blocky to sub platy to platy, moderately soft to firm, calcareous, occasional sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, platy, soft, no stain, fluorescence, or cut
- 4870-4900 Siltstone reddish brown, occasional gray, sub blocky to sub platy to platy, moderately soft to firm, calcareous, occasional sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, platy, soft, no stain, fluorescence, or cut
- 4900-4930 Siltstone reddish brown, occasional gray, sub blocky to sub platy to platy, moderately soft to firm, very calcareous, occasional sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, platy, soft, no stain, fluorescence, or cut
- 4930-4960 Siltstone reddish brown to brown, occasional gray, sub blocky to sub platy to platy, moderately soft to firm, very calcareous, occasional sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, rare green, platy, soft, no stain, fluorescence, or cut
- 4960-4990 Siltstone reddish brown to brown, occasional gray, sub blocky to sub platy to platy, moderately soft to firm, very calcareous, some sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, rare green, platy, soft, no stain, fluorescence, or cut
- 4990-5020 Siltstone reddish brown to brown, occasional gray, rare yellow, sub blocky to sub platy to platy, moderately soft to firm, very calcareous, abundant sandstone translucent to white, occasional salt and pepper, fine to medium grained, angular to sub angular, consolidated to friable, calcareous, occasional shale reddish brown, rare green, platy, soft, no stain, fluorescence, or cut
- 5020-5050 Siltstone reddish brown to brown, sub blocky to sub platy to platy, firm, very calcareous, occasional sandstone translucent to white, salt and pepper in part, fine to very fine grained, angular to sub rounded, moderately consolidated, calcareous, occasional shale gray, rare yellow, sub blocky, firm, no stain, fluorescence, or cut
- 5050-5080 Sandstone translucent to white to light orange, occasional salt and pepper, medium to fine grained, abundant limestone translucent quartz grains, angular to sub rounded, poorly consolidated, poorly sorted, calcareous, fair porosity, trace siltstone, reddish brown, sub platy, soft, trace shale, gray to green, sub blocky, firm, no stain, fluorescence, or cut
- 5080-5110 Siltstone reddish brown, sub platy to platy, soft to moderately firm, very calcareous, abundant sandstone, translucent to white to gray to light orange, salt and pepper in part, fine to very fine grained, angular to sub rounded, poorly to moderately sorted, poorly to moderately consolidated, very calcareous, fair porosity, trace shale, gray to yellow green, sub platy, no stain, fluorescence, or cut
- 5110-5140 Siltstone reddish brown, sub platy to platy, moderately firm, very calcareous, some mudstone, reddish brown, soft, trace sandstone, translucent to white, salt and pepper in part, very fine grained, some loose quartz, angular to sub rounded, moderately consolidated, poorly sorted, calcareous, trace shale, gray to green, sub platy, no stain, fluorescence, or cut

- 5140-5170 Siltstone brown to reddish brown, sub platy to platy, firm, some mudstone a/a, trace sandstone a/a, trace shale gray to green, occasional yellow, sub platy, no stain, fluorescence, or cut
- 5170-5200 Siltstone gray to brown to reddish brown, sub platy to platy, firm, very calcareous, some mudstone, reddish brown, soft, occasional sandstone, translucent to light tan, salt and pepper in part, some loose quartz grains, angular to sub rounded, poorly sorted, moderately consolidated, calcareous, trace shale gray to green, sub platy, no stain, fluorescence, or cut
- 5200-5230 Siltstone reddish brown, sub platy to platy, firm, very calcareous, occasional mudstone, reddish brown, soft, abundant sandstone, translucent to white, some salt and pepper, fine to very fine grained, angular to sub rounded, moderately sorted, moderately consolidated, calcareous, trace shale gray to green, sub platy, sandy, dull orange fluorescence, no stain or cut
- 5230-5260 Siltstone reddish brown, sub platy to platy, firm, very calcareous, occasional mudstone, reddish brown, soft, occasional sandstone, translucent to white to light tan, some salt and pepper, fine to very fine grained, angular to sub rounded, moderately sorted, moderately consolidated, calcareous, occasional shale variegated, sub blocky, sandy, no stain, fluorescence, or cut
- 5260-5290 Siltstone brown reddish brown, sub platy to platy, firm, very calcareous, some mudstone, reddish brown, soft, occasional sandstone, translucent to white, salt and pepper in part, medium to very fine grained, angular to sub rounded, poorly sorted, moderately consolidated, calcareous, trace pyrite inclusions, occasional shale variegated, sub blocky, sandy in part, sub waxy, no stain, fluorescence, or cut
- 5290-5320 Siltstone reddish brown, sub blocky to sub platy, hard, very calcareous, occasional sandstone, translucent to white to light gray, trace salt and pepper, fine to very fine grained, sub angular to sub rounded, well sorted, well consolidated, calcareous, occasional shale variegated, sub platy, sub waxy, no stain, fluorescence, or cut
- 5320-5350 Siltstone light brown to reddish brown, sub blocky to sub platy to platy, firm, very calcareous, some mudstone, reddish brown, soft, occasional sandstone, translucent to white to light gray, salt and pepper in part, medium to very fine grained, angular to sub rounded, poorly sorted, moderately consolidated, calcareous, trace pyrite inclusions, occasional shale light gray to gray to green, sub blocky to sub platy, sub waxy, no stain, fluorescence, or cut
- 5350-5380 Siltstone light brown to reddish brown, sub platy to platy, firm, very calcareous, some mudstone reddish brown, soft, occasional shale light gray to gray to green, sub blocky to sub platy, sub waxy, trace sandstone translucent to white, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, well sorted, moderately consolidated, calcareous, no stain, fluorescence, or cut
- 5380-5410 Siltstone light brown to reddish brown, sub blocky to sub platy to platy, firm, very calcareous, some mudstone reddish brown, soft, occasional shale light gray to gray to green, sub blocky to sub platy, sub waxy, trace sandstone translucent to white, salt and pepper in part, medium to very fine grained, angular to sub rounded, moderately sorted, poorly consolidated, calcareous, trace pyrite inclusion, no stain, fluorescence, or cut
- 5410-5440 Siltstone light brown to reddish brown, sub blocky to sub platy to platy, firm, very calcareous, occasional sandstone translucent to white to light gray, salt and pepper in part, medium to very fine grained, angular to sub rounded, poorly sorted, well consolidated, calcareous, trace shale light gray to gray to green, sub blocky to sub platy, sub waxy, slightly dull orange fluorescence, no stain or cut
- 5440-5470 Siltstone light brown to reddish brown, sub platy to platy, firm, very calcareous, occasional shale light gray to gray to green, sub blocky to sub platy, sub waxy, trace sandstone translucent to white, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, moderately

sorted, poorly consolidated, calcareous, no stain, fluorescence, or cut

- 5470-5500 Siltstone reddish brown, sub blocky to sub platy to platy, firm, very calcareous, occasional sandstone, translucent to white to light gray, salt and pepper in part, medium to very fine grained, angular to sub rounded, poorly sorted, poorly consolidated, calcareous, trace shale light gray to gray to green, sub platy, no stain, fluorescence, or cut
- 5500-5530 Siltstone reddish brown to yellow, sub platy to platy, soft to firm, very calcareous, occasional shale variegated to gray to green, sub blocky to sub platy, dull to sub waxy, trace sandstone translucent to white, some salt and pepper, very fine grained, sub rounded, well sorted, well consolidated, calcareous, no stain, fluorescence, or cut
- 5530-5560 Siltstone reddish brown to yellow, sub platy to platy, soft to firm, very calcareous, occasional shale variegated to gray to green, sub blocky to sub platy, dull to sub waxy, trace sandstone translucent to white, some salt and pepper, very fine grained, sub rounded, well sorted, poorly consolidated to friable, trace limestone light gray, hard, coarse crystalline, no stain, fluorescence, or cut
- 5560-5590 Sandstone white to translucent to salt and pepper, medium to coarse grained, angular to sub angular, unconsolidated, very calcareous, some siltstone brown to tan, occasional gray, sub blocky to sub platy, moderately soft, very calcareous, no stain, fluorescence, or cut
- 5590-5620 Siltstone brown to reddish brown, occasional gray, rare yellow, sub platy, moderately soft to firm, very calcareous, occasional sandstone translucent to white to gray, some brown to reddish brown, medium to coarse grained, sub rounded to sub angular, poorly consolidated to friable, moderately soft, calcareous, no stain, fluorescence, or cut
- 5620-5650 Siltstone reddish brown, occasional brown to gray, rare yellow, platy to sub blocky, moderately soft to firm, very calcareous, some shale reddish brown to gray, platy to sub platy, moderately soft, silty, calcareous, occasional sandstone a/a, rare limestone tan, micro crystalline, hard, no stain, fluorescence, or cut
- 5650-5680 Siltstone reddish brown to brown, occasional gray to tan, platy to sub blocky, moderately soft to firm, very calcareous, some shale reddish brown to gray, platy to sub platy, moderately soft, silty, calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 5680-5710 Siltstone reddish brown to brown, occasional gray to tan, platy to sub blocky, moderately soft to firm, very calcareous, some shale reddish brown to gray, platy to sub platy, moderately soft, silty, calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 5710-5740 Siltstone reddish brown to brown, occasional brown to gray, rare yellow to brown, platy to sub blocky, moderately soft to firm, very calcareous, some shale reddish brown to gray, platy to sub platy, moderately soft, silty, calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 5740-5770 Siltstone brown to reddish brown, occasional brown to gray, rare yellow to brown, platy to sub blocky, moderately soft to firm, very calcareous, some shale reddish brown to gray, platy to sub platy, moderately soft, silty, calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 5770-5800 Sandstone translucent to reddish brown to brown, fine to medium grained, sub rounded to sub angular, poorly consolidated to friable, very calcareous, abundant siltstone brown to reddish brown, occasional gray, platy to sub blocky, moderately soft, calcareous, occasional shale brown to reddish brown, rare gray, platy, soft, no stain, fluorescence, or cut
- 5800-5830 Sandstone translucent to brown to reddish brown, fine to medium grained, sub rounded to sub angular, poorly consolidated to friable, very calcareous, abundant siltstone brown to reddish brown, occasional gray, platy to sub blocky, moderately soft, calcareous, occasional shale brown

to reddish brown, rare gray, platy, soft, no stain, fluorescence, or cut

5830-5860 Siltstone reddish brown to brown, occasional tan to gray, sub blocky to platy, moderately soft to firm, very calcareous, occasional sandstone translucent to white to gray, fine grained, sub rounded to sub angular, poorly consolidated to friable, calcareous, occasional shale reddish brown to gray, platy, soft, calcareous, no stain, fluorescence, or cut

5860-5890 Siltstone reddish brown to brown, occasional tan to gray, sub blocky to platy, moderately soft to firm, very calcareous, some sandstone translucent to white to gray, fine grained, sub rounded to sub angular, poorly consolidated to friable, calcareous, occasional shale reddish brown to gray, platy, soft, calcareous, no stain, fluorescence, or cut

5890-5920 Sandstone translucent to white to salt and pepper, occasional light gray, fine to medium grained, sub rounded to sub angular, unconsolidated, calcareous, occasional siltstone reddish brown to brown, moderately soft to firm, occasional shale a/a, no stain, fluorescence, or cut

5920-5950 Siltstone brown to reddish to brown, some yellow, sub blocky to sub platy to platy, moderately firm to firm, calcareous, occasional shale gray to green, sub blocky to sub platy to platy, firm, sub waxy in part, trace sandstone translucent to white to gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, calcareous, trace pyrite inclusions, no stain, fluorescence, or cut

5950-5980 Siltstone reddish to brown to orange brown, some variegated, sub blocky to sub platy to platy, soft to moderately firm, calcareous, occasional sandstone translucent to white to light gray, occasional salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately sorted, moderately consolidated, calcareous, occasional shale variegated to gray to green, sub blocky to sub platy, moderately firm, sub waxy in part, trace limestone light gray, firm, sandy, no stain, fluorescence, or cut

5980-6000 Siltstone brown to orange brown, sub blocky to sub platy to platy, soft to moderately firm, calcareous, occasional sandstone a/a, occasional shale a/a, trace limestone light gray, firm, sandy, no stain, fluorescence, or cut

6000-6020 Siltstone brown to orange brown, sub blocky to sub platy to platy, soft to moderately firm, calcareous, occasional sandstone translucent to white to light gray, abundant salt and pepper, medium to very fine grained, angular to sub rounded, poorly sorted, moderately consolidated, calcareous, occasional shale gray to green, sub platy to platy, sandy in part, no stain, fluorescence, or cut

6020-6040 Siltstone brown to reddish brown, some yellow, pink, sub blocky to sub platy to platy, soft to moderately firm, calcareous, occasional sandstone a/a, occasional shale variegated to gray to dark gray, sub blocky to sub platy, hard, trace limestone gray, no stain, fluorescence, or cut

6040-6060 Sandstone translucent to white, medium to fine grained, angular to sub rounded, abundant salt and pepper, unconsolidated, poorly sorted, slightly calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut

6060-6080 Sandstone translucent to white, some yellow, pink, medium to fine grained, angular to sub rounded, salt and pepper in part, unconsolidated, poorly sorted, calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut ✓

6080-6100 Sandstone translucent to white, medium to fine grained, angular to sub rounded, salt and pepper in part, unconsolidated, poorly sorted, calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut

6100-6120 Siltstone brown to reddish brown, some yellow, sub blocky to sub platy to platy, soft to moderately firm, calcareous, abundant sandstone translucent to white, some tan, rare salt and

pepper, very fine grained, sub rounded, moderately consolidated, well sorted, very calcareous, occasional shale variegated to gray, sub blocky, firm, sub waxy, sandy in part, no stain, fluorescence, or cut

6120-6140 Sandstone translucent to white, some pink, medium to fine grained, angular to sub rounded, abundant salt and pepper, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut ✓

6140-6160 Siltstone brown to reddish brown, sub platy to platy, soft to moderately firm, calcareous, mudstone in part, abundant sandstone translucent to white, salt and pepper in part, very fine grained, sub rounded, poorly consolidated, moderately sorted, very calcareous, occasional shale variegated to gray, sub blocky to sub platy, firm, sub waxy, carbonaceous in part, no stain, fluorescence, or cut

6160-6180 Sandstone translucent to white, some pink, medium to fine grained, angular to sub rounded, abundant salt and pepper, poorly consolidated to unconsolidated, poorly sorted, calcareous, abundant siltstone brown to reddish to brown, sub platy, moderately firm to firm, calcareous, occasional shale a/a, no stain, fluorescence, or cut

6180-6200 Siltstone light brown to brown, occasional reddish brown to gray, platy to sub blocky, moderately soft to firm, very calcareous, mudstone in part, abundant sandstone translucent to white to salt and pepper, fine to medium grained, sub rounded to angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, occasional shale a/a, no stain, fluorescence, or cut

6200-6220 Siltstone brown to reddish brown to gray, occasional tan, platy to sub blocky, moderately soft to firm, very calcareous, mudstone in part, abundant sandstone a/a, occasional shale reddish brown to brown, occasional medium gray, platy to splintery to sub blocky, moderately firm, calcareous, carbonaceous in part, sandy in part, no stain, fluorescence, or cut

6220-6240 Siltstone brown to gray brown to reddish brown, some yellow, platy to sub blocky, firm, very calcareous, occasional shale medium gray to green, sub blocky to sub platy, moderately firm, slightly calcareous, sandy in part, trace sandstone, white to light gray, abundant salt and pepper, very fine grained, sub angular to sub rounded, poorly consolidated to friable, poorly sorted, calcareous, no stain, fluorescence, or cut

6240-6260 Siltstone a/a, occasional shale a/a, trace sandstone a/a, trace limestone gray, hard, sandy, slight mineral fluorescence, no stain or cut

6260-6280 Siltstone a/a, occasional sandstone, translucent to white to light gray to tan, salt and pepper in part, some loose quartz grains, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, very calcareous, trace shale light gray to gray to green, sub blocky to sub platy, sandy in part, sub waxy, no stain, fluorescence, or cut

6280-6300 Sandstone white, very fine grained, some translucent, medium grained, some limestone quartz grains, salt and pepper in part, sub angular to sub rounded, consolidated, well to poorly sorted, very calcareous, abundant siltstone a/a, occasional shale gray, sub blocky to platy, firm, carbonaceous in part, no stain, fluorescence, or cut

6300-6320 Siltstone brown to reddish brown, platy to sub blocky, moderately soft to firm, very calcareous, occasional sandstone off white to light gray, occasional translucent, some loose quartz grains, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, moderately to poorly sorted, very calcareous, trace shale medium to dark gray, occasional yellow, splintery to sub blocky, moderately firm, sandy in part, trace glauconite, no stain, fluorescence, or cut

6320-6340 Sandstone translucent to white to light gray, some limestone quartz grains, salt and pepper in part, medium to fine grained, angular to sub rounded, poorly consolidated to unconsolidated,

poorly sorted, very calcareous, abundant siltstone a/a, trace shale gray, sub blocky to platy, firm, no stain, fluorescence, or cut

6340-6360 Siltstone brown to reddish brown, occasional tan, platy to sub blocky, moderately firm, very calcareous, abundant sandstone white to light gray, some translucent, fine to very fine grained, salt and pepper in part, sub angular to sub rounded, consolidated, well to poorly sorted, calcareous, trace shale a/a, no stain, fluorescence, or cut

6360-6380 Siltstone brown to reddish brown, occasional tan, platy to sub blocky, moderately firm, very calcareous, abundant sandstone white to light gray, some translucent, fine to very fine grained, salt and pepper in part, angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, occasional shale light to dark gray, yellow in part, sub blocky to splintery to platy, firm, slightly dull orange fluorescence, no stain, fluorescence, or cut

6380-6400 Siltstone a/a, occasional shale a/a, occasional sandstone a/a, trace limestone gray to cream, hard, no stain, fluorescence, or cut

6400-6420 Sandstone translucent to white to light gray, some pink, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, moderately consolidated, well sorted, very calcareous, abundant siltstone a/a, trace shale gray to green, sub blocky to platy, firm, no stain, fluorescence, or cut

6420-6440 Sandstone translucent to white to light gray, some pink, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, moderately consolidated, well sorted, very calcareous, abundant siltstone a/a, trace shale gray to green, sub blocky to platy, firm, no stain, fluorescence, or cut

6440-6460 Sandstone translucent to white to light gray to tan, some pink, abundant limestone translucent quartz grains, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, abundant siltstone a/a, trace shale a/a, trace limestone gray to pink to cream, yellow in part, firm, micritic, no stain, fluorescence, or cut

6460-6480 Siltstone brown to reddish brown, rare light orange, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone white to translucent to salt and pepper, occasional gray, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare limestone light gray to tan, moderately firm, micritic, no stain, fluorescence, or cut

6480-6500 Siltstone brown to reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone a/a, trace shale reddish brown to brown, platy, soft, calcareous, rare limestone light gray to tan, moderately firm, micritic, no stain, fluorescence, or cut

6500-6520 Siltstone light reddish brown to light brown, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone a/a, trace shale light reddish brown to brown to light gray, rare off white, platy, soft, calcareous, trace dull orange mineral fluorescence, no stain or cut

6520-6540 Sandstone white to translucent to gray, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, trace shale a/a, no stain, fluorescence, or cut

6540-6560 Siltstone light reddish brown to light brown, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone a/a, trace shale light reddish brown to brown to light gray, rare off white, platy, soft, calcareous, rare dull orange mineral fluorescence, no stain or cut

6560-6580 Siltstone brown to gray, occasional reddish brown, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone a/a, trace shale brown to reddish brown to gray, platy, soft,

calcareous, no stain, fluorescence, or cut

6580-6600 Sandstone white to translucent, occasional gray to light gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, some siltstone a/a, rare shale a/a, no stain, fluorescence, or cut

6600-6620 Sandstone white to translucent, occasional gray to light gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, abundant siltstone brown to yellow to gray, occasional reddish brown, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, rare shale a/a, no stain, fluorescence, or cut

6620-6640 Siltstone brown to reddish brown to gray, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, abundant sandstone a/a, occasional shale a/a, no stain, fluorescence, or cut

6640-6660 Sandstone white to translucent, occasional gray to light gray to salt and pepper, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, abundant siltstone brown to yellow to gray, occasional reddish brown, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, rare shale a/a, no stain, fluorescence, or cut

6660-6680 Sandstone white to translucent, occasional gray to light gray to salt and pepper, rare pink, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, abundant siltstone brown to yellow to gray, occasional reddish brown, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, rare shale a/a, no stain, fluorescence, or cut

6680-6700 Sandstone white to light gray to translucent, occasional salt and pepper, rare pink, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, calcareous, abundant siltstone brown to buff to gray, occasional reddish brown, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, rare shale a/a, no stain, fluorescence, or cut

6700-6720 Sandstone white to light gray to translucent to pink, occasional salt and pepper, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, abundant siltstone light brown to buff to gray, rare reddish brown, sub platy to sub blocky, moderately soft to moderately firm, very calcareous, rare shale a/a, no stain, fluorescence, or cut

6720-6740 Sandstone white to light gray to translucent to pink, occasional salt and pepper, fine to very fine grained, some loose translucent quartz coarse grains, angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, abundant siltstone light brown to buff to gray, rare reddish brown, yellow, sub platy to sub blocky, moderately soft to moderately firm, calcareous, trace shale medium gray to green, sub blocky to splintery, moderately firm, sub waxy in part, sandy in part, no stain, fluorescence, or cut

6740-6760 Sandstone white to light gray to translucent to pink, rare salt and pepper, medium to very fine grained, sub angular to sub rounded, moderately consolidated, poorly to well sorted, calcareous, abundant siltstone a/a, trace shale variegated, sub blocky to sub platy, moderately firm, trace pyrite, no stain, fluorescence, or cut

6760-6780 Sandstone white to light gray to translucent, rare pink, rare salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, well sorted, calcareous, abundant siltstone a/a, occasional shale variegated, sub blocky to sub platy, moderately firm, trace carbonaceous, no stain, fluorescence, or cut

6780-6800 Siltstone light reddish brown to light brown, rare white, sub platy to sub blocky, moderately soft to firm, very calcareous, some sandstone translucent to white, salt and pepper in part, fine to very fine good, sub angular to sub rounded, moderately consolidated, well sorted, occasional shale variegated to gray, sub blocky to sub platy, moderately firm, sandy in part, trace limestone

cream, hard, sandy in part, slightly dull orange fluorescence, no stain or cut

6800-6820 Sandstone white to light gray to translucent, rare salt and pepper, some limestone quartz grains, fine to very fine grained, sub angular to sub rounded, moderately consolidated, well sorted, calcareous, abundant siltstone a/a, occasional shale variegated, sub blocky to sub platy, moderately firm, trace limestone cream to pink, hard, micritic, slight dull orange fluorescence, no stain or cut

6820-6840 Sandstone white to translucent, some salt and pepper, some limestone quartz grains, fine to very fine grained, sub angular to sub rounded, moderately consolidated, well sorted, very calcareous, abundant siltstone a/a, occasional shale variegated, sub blocky to sub platy, moderately firm, sandy in part, trace limestone cream to pink, hard, micritic, slight dull mineral fluorescence, no stain or cut

6840-6860 Sandstone white to translucent, some pink, some salt and pepper, fine to very fine grained, sub rounded to rounded, moderately consolidated, well sorted, very calcareous, abundant siltstone a/a, occasional shale variegated, sub blocky to sub platy, moderately firm, sandy in part, trace limestone cream to pink, hard, micritic, slight dull orange fluorescence, no stain or cut

6860-6880 Sandstone white to translucent, some salt and pepper, fine to very fine grained, sub angular to rounded, moderately consolidated, well sorted, calcareous, abundant limestone white to cream, hard, sandy, occasional siltstone a/a, occasional shale a/a, some mineral fluorescence, no stain or cut

6880-6900 Sandstone white to translucent to light gray, salt and pepper in part, some limestone, translucent quartz grains, fine to very fine grained, sub angular to sub rounded, moderately consolidated, moderately sorted, calcareous, occasional limestone white to cream, hard, sandy, occasional siltstone light brown to reddish brown, sub blocky to sub platy, moderately soft to firm, calcareous, occasional shale variegated to gray, sub blocky to sub platy, moderately firm, sandy in part, slight mineral fluorescence, no stain or cut

6900-6920 Sandstone white to translucent to light gray, salt and pepper in part, some limestone, translucent quartz grains, fine to very fine grained, sub angular to sub rounded, moderately consolidated, moderately sorted, calcareous, occasional limestone white to cream, hard, sandy, occasional siltstone a/a, occasional shale a/a, trace carbonaceous, slight dull orange fluorescence, no stain or cut

6920-6940 Sandstone white to translucent to light gray, some pink, salt and pepper in part, abundant limestone, quartz grains, medium to very fine grained, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, occasional siltstone a/a, occasional shale a/a, trace limestone white to cream to light gray, hard, slight dull orange fluorescence, no stain or cut

6940-6960 Sandstone white to translucent to light gray, some pink, salt and pepper in part, abundant limestone, quartz grains, medium to very fine grained, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, occasional siltstone a/a, occasional shale a/a, trace limestone white to cream to light gray, hard, slight dull orange fluorescence, no stain or cut

6960-6980 Sandstone white to light gray to translucent, some salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, occasional siltstone light gray to brown, occasional reddish brown to yellow, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, trace limestone a/a, no stain, fluorescence, or cut

6980-7000 Sandstone white to light gray to translucent, some salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, some siltstone light gray to brown, occasional reddish brown, rare yellow, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, trace limestone a/a, trace pyrite, no stain, fluorescence, or cut



- 7000-7020 Sandstone white to light gray to translucent to salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, occasional siltstone light gray to brown, occasional reddish brown, rare yellow, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 7020-7040 Sandstone white to light gray to translucent, some salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, occasional siltstone light gray to brown, occasional reddish brown, rare yellow, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 7040-7060 Sandstone white to light gray to translucent, occasional salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, abundant siltstone medium to dark brown to gray, occasional reddish brown, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, rare limestone white to cream to light gray, hard, no stain, fluorescence, or cut
- 7060-7080 Sandstone white to translucent to light gray, occasional salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, some siltstone reddish brown to light brown, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 7080-7100 Sandstone white to translucent to light gray, occasional salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, some siltstone dark to light brown, occasional reddish brown, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 7100-7120 Sandstone white to translucent to light gray, occasional salt and pepper, sub rounded to sub angular, poorly consolidated, poorly sorted, very calcareous, some siltstone dark to light brown, occasional reddish brown, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 7120-7140 Siltstone dark brown to gray to reddish brown, occasional yellow to tan, sub platy to sub blocky, moderately firm, sandy in part, calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 7140-7160 Sandstone translucent to white to light gray, pink in part, fine to very fine grained, abundant limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone, gray to brown to reddish brown, yellow in part, sub blocky to sub platy, moderately soft to firm, calcareous, occasional shale, variegated to gray, sub blocky to sub platy, firm, calcareous, trace carbonaceous, trace limestone gray, hard, sandy, slight mineral fluorescence, no stain or cut
- 7160-7180 Sandstone translucent to white to light gray, pink in part, fine to very fine grained, abundant limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone a/a, occasional shale a/a, trace limestone gray, hard, sandy, slight mineral fluorescence, no stain or cut
- 7180-7200 Sandstone translucent to white to light gray, pink in part, fine to very fine grained, abundant limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone a/a, occasional shale a/a, trace carbonaceous shale, trace limestone gray to cream, hard, sandy, slight mineral fluorescence, no stain or cut
- 7200-7220 Sandstone translucent to white to light gray, pink in part, fine to very fine grained, abundant limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone a/a, occasional shale dark gray to gray, yellow in part, sub blocky, firm, trace limestone gray to cream, hard, sandy, no stain,

fluorescence, or cut

7220-7240 Sandstone white to translucent to light gray, fine to very fine grained, some limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone a/a, occasional shale variegated to gray, sub blocky, firm, trace limestone gray, hard, sandy, trace mineral fluorescence, no stain or cut

7240-7260 Sandstone white to translucent to light gray, fine to very fine grained, some limestone, quartz grains, salt and pepper in part, sub angular to sub rounded, poorly consolidated, well to poorly sorted, calcareous, abundant siltstone a/a, occasional shale variegated to gray, sub blocky, firm, sandy in part, trace pyrite, trace mineral fluorescence, no stain or cut

7260-7280 Shale variegated to dark to medium gray to green, some yellow, sub blocky to sub platy, moderately firm to hard, calcareous in part, abundant sandstone a/a, abundant siltstone a/a, no stain, fluorescence, or cut

7280-7300 Siltstone gray to brown to reddish brown, sub blocky to sub platy, moderately soft to firm, slightly calcareous, abundant shale a/a, occasional sandstone a/a, slight mineral fluorescence, no stain or cut

7300-7320 Shale variegated to dark to medium gray to green, some yellow, sub blocky to sub platy, moderately firm to hard, calcareous in part, trace carbonaceous, abundant sandstone white to translucent to light gray, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, moderately sorted, calcareous, abundant siltstone a/a, slight trace limestone a/a, no stain, fluorescence, or cut

7320-7340 Shale variegated to dark to medium gray to green, some yellow, sub blocky to sub platy, moderately firm to hard, sandy in part, calcareous in part, abundant siltstone a/a, trace sandstone a/a, trace limestone a/a, no stain, fluorescence, or cut

7340-7360 Shale variegated to dark to medium gray to green, sub blocky to sub platy, moderately firm to hard, calcareous in part, abundant siltstone gray to brown to reddish brown, sub blocky to sub platy, moderately firm to firm, slightly calcareous, trace sandstone a/a, no stain, fluorescence, or cut

7360-7380 Siltstone reddish brown to brown, sub blocky, moderately firm, calcareous, abundant shale light to medium gray, sub platy to sub blocky, moderately soft, slightly calcareous, some sandstone white to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately sorted, moderately consolidated to unconsolidated, calcareous, no stain, fluorescence, or cut

7380-7400 Siltstone reddish brown to brown, occasional gray, rare yellow, sub blocky, moderately firm, calcareous, abundant shale light to medium gray, sub platy to sub blocky, moderately soft, slightly calcareous, some sandstone white to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately sorted, moderately consolidated to unconsolidated, calcareous, no stain, fluorescence, or cut

7400-7410 Sandstone translucent to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated, non calcareous, abundant siltstone a/a, some shale a/a, no stain, fluorescence, or cut

7410-7420 Siltstone brown to reddish brown to gray to tan, sub blocky to platy, moderately soft to firm, slightly calcareous, trace shale a/a, trace sandstone a/a, no stain, fluorescence, or cut

7420-7430 Siltstone brown to reddish brown to gray to tan, rare purple, sub blocky to platy, moderately soft to firm, slightly calcareous, trace shale a/a, trace sandstone a/a, no stain, fluorescence, or cut

- 7430-7440 Siltstone brown to reddish brown to gray to tan, sub blocky to sub platy, moderately soft to firm, slightly calcareous, trace shale gray to tan, sub platy to sub blocky, moderately soft, slightly calcareous, trace sandstone a/a, no stain, fluorescence, or cut
- 740-7450 Siltstone brown to reddish brown to gray to tan, sub blocky to sub platy, moderately soft to firm, slightly calcareous, occasional sandstone a/a, trace shale gray to tan, sub platy to sub blocky, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 7450-7460 Sandstone white to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly to moderately sorted, slightly calcareous, abundant siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 7460-7470 Siltstone reddish brown to brown to gray, rare yellow, rare purple, sub blocky, moderately firm, non calcareous, abundant sandstone a/a, some shale gray to brown, splintery to platy, moderately soft to moderately firm, slightly calcareous, no stain, fluorescence, or cut
- 7470-7480 Siltstone reddish brown to brown to gray, rare yellow, rare purple, sub blocky, moderately firm, non calcareous, abundant sandstone a/a, some shale gray to brown, splintery to platy, moderately soft to moderately firm, slightly calcareous, no stain, fluorescence, or cut
- 7480-7490 Siltstone reddish brown to brown to gray, rare yellow, rare purple, sub blocky, moderately firm, slightly calcareous, abundant shale dark gray to gray, splintery to platy, moderately soft to moderately firm, slightly calcareous, rare sandstone white, very fine grained, salt and pepper in part, sub rounded, moderately consolidated, well sorted, calcareous, no stain, fluorescence, or cut
- 7490-7500 Siltstone a/a, abundant shale a/a, rare carbonaceous shale, rare sandstone a/a, no stain, fluorescence, or cut
- 7500-7510 Siltstone a/a, abundant shale a/a, rare carbonaceous shale, rare sandstone a/a, no stain, fluorescence, or cut
- 7510-7520 Siltstone a/a, abundant shale a/a, trace sandstone, translucent to white, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, calcareous, no stain, fluorescence, or cut
- 7520-7530 Siltstone a/a, abundant shale a/a, trace sandstone, translucent to white, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, calcareous, no stain, fluorescence, or cut
- 7530-7540 Sandstone white to light gray to translucent, very fine to fine grained, sub rounded to sub angular, moderately sorted, moderately consolidated to unconsolidated, non calcareous, abundant siltstone reddish brown to brown to gray, sub blocky, moderately soft to firm, slightly calcareous, trace shale gray to brown, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 7540-7550 Sandstone white to light gray to translucent, occasional salt and pepper, very fine to fine grained, sub rounded to sub angular, moderately sorted, moderately consolidated to unconsolidated, non calcareous, abundant siltstone reddish brown to brown to gray, occasional tan, sub blocky, moderately soft to firm, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut
- 7550-7560 Siltstone brown to reddish brown to gray, occasional tan, rare purple, sub blocky to blocky, moderately firm, sandy in part, very slightly calcareous, some sandstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 7560-7570 Sandstone white to light gray to translucent, occasional salt and pepper, very fine to fine grained, sub rounded to sub angular, moderately sorted, moderately consolidated to unconsolidated, non calcareous, abundant siltstone reddish brown to brown to gray, occasional

tan, sub blocky, moderately soft to firm, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut

- 7570-7580 Sandstone light gray to white to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately sorted, poorly consolidated to unconsolidated, non calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 7580-7590 Sandstone a/a, abundant siltstone gray to brown, occasional reddish brown to tan, sub blocky to blocky, moderately firm, calcareous, sandy in part, trace shale a/a, no stain, fluorescence, or cut
- 7590-7600 Sandstone a/a, abundant siltstone light to medium brown, occasional reddish brown to tan, rare buff, sub blocky to blocky, moderately firm, calcareous, sandy in part, trace shale a/a, no stain, fluorescence, or cut
- 7600-7610 Sandstone white to translucent to light gray, some salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, some siltstone brown to gray, occasional reddish brown, sub blocky to blocky, moderately firm, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut
- 7610-7620 Sandstone white to translucent to light gray, some salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, some siltstone brown to gray, occasional reddish brown, sub blocky to blocky, moderately firm, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut
- 7620-7630 Sandstone gray to translucent, occasional white, some salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 7630-7640 Sandstone translucent to white, occasional gray, fine to medium grained, sub rounded to sub angular, unconsolidated to poorly consolidated, non calcareous, trace siltstone a/a, no stain, fluorescence, or cut
- 7640-7650 Sandstone white to light gray to translucent, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated to friable to unconsolidated, very calcareous, abundant siltstone brown to gray to tan, sub blocky to blocky, moderately firm, very calcareous, occasional shale gray to brown, sub platy to platy, laminated, slightly calcareous, trace pyrite nodules, trace dull orange mineral fluorescence, no stain or cut
- 7650-7660 Sandstone white to light gray to translucent, occasional salt and pepper, rare cream, fine to very fine grained, sub rounded to sub angular, consolidated to friable to unconsolidated, very calcareous, abundant siltstone a/a, occasional shale a/a, rare dull orange mineral fluorescence, no stain or cut
- 7660-7670 Sandstone white to translucent, occasional light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, very calcareous, abundant siltstone dark gray to brown, occasional reddish brown to tan, sub blocky to blocky, moderately firm, calcareous, occasional shale gray, sub platy to platy, slightly calcareous, no stain, fluorescence, or cut
- 7670-7680 Sandstone a/a, some siltstone brown to gray, occasional reddish brown, rare buff, sub blocky to blocky, moderately soft to moderately firm, calcareous, trace shale gray to brown, rare buff, platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 7680-7690 Sandstone a/a, some siltstone brown to gray, occasional reddish brown, rare buff, sub blocky to blocky, moderately soft to moderately firm, calcareous, trace shale gray to brown, rare buff, platy, moderately soft, calcareous, no stain, fluorescence, or cut

- 7690-7700 Sandstone white to light gray to translucent, very fine to fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very calcareous, some siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 7700-7710 Sandstone white to light gray to translucent, very fine to fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, some siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 7710-7720 Siltstone brown to gray to reddish brown, occasional cream to tan, sub blocky to blocky, moderately firm, calcareous, some sandstone a/a, trace shale a/a, trace dull orange mineral fluorescence, no stain or cut
- 7720-7730 Siltstone brown to gray to reddish brown, occasional cream to tan, sub blocky to blocky, moderately firm, calcareous, some sandstone a/a, trace shale a/a, trace dull orange mineral fluorescence, no stain or cut
- 7730-7740 Sandstone white to light gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, very calcareous, occasional shale variegated to gray to green, sub blocky to platy to splintery, moderately firm, sandy in part, occasional siltstone a/a, trace limestone light gray to cream, moderately firm, micritic, dull mineral orange fluorescence, no stain or cut
- 7740-7750 Sandstone a/a, occasional shale a/a, some siltstone a/a, trace limestone a/a, slight dull orange fluorescence, no stain or cut
- 7750-7760 Sandstone a/a, some shale a/a, some siltstone a/a, trace limestone a/a, slight dull orange fluorescence, no stain or cut
- 7760-7770 Sandstone white to translucent, some salt and pepper, abundant limestone quartz grains, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, some shale a/a, some siltstone a/a, no stain, fluorescence, or cut
- 7770-7780 Sandstone white to translucent, some salt and pepper, abundant limestone quartz grains, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, some shale a/a, trace siltstone a/a, no stain, fluorescence, or cut
- 7780-7790 Sandstone white to translucent, some salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, some shale a/a, trace siltstone a/a, rare dull orange fluorescence, no stain or cut
- 7790-7800 Sandstone white to translucent, some salt and pepper, fine to very fine good, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace shale dark gray to gray, sub blocky to sub platy to splintery, moderately firm, trace siltstone a/a, no stain, fluorescence, or cut
- 7800-7810 Sandstone white to translucent, rare salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace shale a/a, trace siltstone a/a, slight mineral fluorescence, no stain or cut
- 7810-7820 Sandstone white to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, moderately to poorly sorted, very calcareous, trace shale a/a, carbonaceous shale in part, trace siltstone a/a, slight mineral fluorescence, no stain or cut
- 7820-7830 Sandstone white to translucent, some light gray, rare salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, moderately to poorly sorted,

very calcareous, trace shale a/a, trace siltstone a/a, no stain, fluorescence, or cut

7830-7840 Sandstone white to translucent, some light gray, some loose pink quartz grains, rare salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, moderately to poorly sorted, very calcareous, trace shale a/a, trace siltstone a/a, slight mineral fluorescence, no stain or cut

7840-7850 Sandstone a/a, occasional shale a/a, carbonaceous in part, occasional siltstone a/a, trace limestone light gray to cream, hard, micritic, slight mineral fluorescence, no stain or cut

7850-7860 Sandstone white to translucent to light gray, fine to very fine grained, some loose coarse quartz grains, salt and pepper in part, sub angular to sub rounded, moderately consolidated to unconsolidated, moderately sorted, calcareous, occasional shale a/a, carbonaceous in part, occasional siltstone a/a, trace limestone a/a, slight mineral fluorescence, no stain or cut

7860-7870 Sandstone white to light gray, pink in part, medium to very fine good, abundant salt and pepper, sub angular to rounded, moderately consolidated, well sorted, rare calcareous, occasional shale a/a, occasional siltstone a/a, trace limestone a/a, no stain, fluorescence, or cut

7870-7880 Sandstone a/a, abundant shale a/a, occasional siltstone a/a, slight dull orange fluorescence, no stain or cut

7880-7890 Sandstone a/a, abundant shale a/a, occasional siltstone a/a, no stain, fluorescence, or cut

7890-7900 Shale dark gray to gray to light green, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, abundant sandstone light gray to light green to white to translucent, salt and pepper in part, fine to very fine grained, sub rounded to rounded, moderately consolidated, well sorted, slightly calcareous, occasional siltstone dark brown to brown to reddish brown, sub blocky to sub platy, moderately firm, trace limestone a/a, no stain, fluorescence, or cut

7900-7910 Shale dark gray to gray to light green, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, abundant sandstone a/a, occasional siltstone dark brown to brown to reddish brown, sub blocky to sub platy, moderately firm, slight mineral fluorescence, no stain or cut

7910-7920 Sandstone white to translucent to light gray, some light green, fine to very fine good, salt and pepper in part, sub angular to sub rounded, moderately consolidated to poorly consolidated, moderately sorted, slightly calcareous, occasional shale a/a, occasional siltstone a/a, trace limestone a/a, no stain, fluorescence, or cut

7920-7930 Sandstone white to translucent to light gray, some light green, fine to very fine grained, abundant salt and pepper, sub angular to sub rounded, moderately consolidated to poorly consolidated, moderately sorted, slightly calcareous, occasional shale a/a, occasional siltstone a/a, trace limestone a/a, slight mineral fluorescence, no stain or cut

7930-7940 Sandstone a/a, occasional shale a/a, occasional siltstone a/a, trace limestone a/a, slight mineral fluorescence, no stain or cut

7940-7950 Sandstone a/a, occasional shale a/a, some yellow, occasional siltstone a/a, trace pyrite, slight mineral fluorescence, no stain or cut

7950-7960 Sandstone white to gray to translucent, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly to moderately consolidated to unconsolidated, moderately to poorly sorted, calcareous, occasional siltstone gray, rare brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut

- 7960-7970 Sandstone white to light gray to translucent, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly to moderately consolidated to unconsolidated, moderately to poorly sorted, calcareous, occasional siltstone light gray, rare brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 7970-7980 Sandstone white to light gray to translucent, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly to moderately consolidated to unconsolidated, moderately to poorly sorted, non calcareous, occasional siltstone light gray, rare brown, sub blocky to sub platy, moderately firm, slightly calcareous, occasional shale light gray, sub platy, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 7980-7990 Sandstone a/a, occasional siltstone light gray, rare brown, rare green, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 7990-8000 Sandstone a/a, occasional siltstone light gray, rare brown, rare green, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8000-8010 Sandstone a/a, occasional siltstone light gray, rare brown, rare tan, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8010-8020 Sandstone white to light gray to translucent, very fine to fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, very calcareous, some siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8020-8030 Sandstone white to light gray to translucent, some salt and pepper, very fine to fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, very calcareous, some siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8030-8040 Sandstone white to light gray to translucent, some salt and pepper, very fine to fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, very calcareous, some siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8040-8050 Sandstone white to gray to translucent, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, moderately to poorly sorted, calcareous, occasional siltstone light gray, rare brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8050-8060 Sandstone white to gray to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, moderately to poorly sorted, calcareous, occasional siltstone light gray, rare brown, rare green, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, rare green, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8060-8070 Sandstone a/a, occasional siltstone light gray, rare yellow to brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8070-8080 Sandstone a/a, occasional siltstone light gray, rare brown to reddish brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut

- 8080-8090 Sandstone a/a, occasional siltstone light gray, rare brown to reddish brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale light gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8090-8100 Sandstone white to translucent to light gray, some salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8100-8110 Sandstone a/a, occasional siltstone gray, occasional dark gray, rare brown to reddish brown, sub blocky to sub platy, moderately firm, calcareous, occasional shale a/a, no stain, fluorescence, or cut
- 8110-8120 Sandstone white to translucent to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, non calcareous, occasional siltstone gray to brown, occasional reddish brown, sub blocky to sub platy, moderately firm, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut
- 8120-8130 Sandstone white to translucent to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, very calcareous, occasional siltstone gray to light brown to brown, occasional reddish brown, sub blocky to sub platy, moderately firm, calcareous, trace shale gray to light brown to brown, platy, soft, calcareous, no stain, fluorescence, or cut
- 8130-8140 Sandstone a/a, occasional siltstone gray to light brown to brown, occasional dark gray, sub blocky to sub platy, moderately firm, calcareous, trace shale gray to light brown to brown, platy, soft, calcareous, no stain, fluorescence, or cut
- 8140-8150 Sandstone a/a, occasional siltstone gray to light brown to brown, occasional reddish brown to dark gray, sub blocky to sub platy, moderately firm, calcareous, trace shale gray to light brown to brown, platy, soft, calcareous, no stain, fluorescence, or cut
- 8150-8160 Sandstone a/a, occasional siltstone gray to light brown to brown, occasional dark gray, sub blocky to sub platy, moderately firm, calcareous, trace shale gray to light brown to brown, platy, soft, calcareous, no stain, fluorescence, or cut
- 8160-8170 Sandstone white to translucent to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, very calcareous, some siltstone gray to brown, occasional dark gray, sub blocky to sub platy, moderately firm, sandy in part, very calcareous, rare shale gray, platy, soft, calcareous, no stain, fluorescence, or cut
- 8170-8180 Sandstone light gray to translucent to white, fine to very fine grained, sub rounded to sub angular, unconsolidated, occasional poorly consolidated, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8180-8190 Sandstone a/a, occasional siltstone light gray, occasional dark gray, sub blocky to sub platy, moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 8190-8200 Sandstone a/a, occasional siltstone light gray, occasional dark gray, sub blocky to sub platy, moderately firm, sandy in part, very calcareous, no stain, fluorescence, or cut
- 8200-8210 Sandstone translucent to gray to white, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, calcareous, occasional siltstone gray to brown, occasional reddish brown, sub blocky to sub platy, sandy in part, calcareous, trace shale gray to brown, sub platy moderately soft, calcareous, no stain, fluorescence, or cut
- 8210-8220 Sandstone white to light gray to translucent, fine to very fine grained, sub rounded to sub angular, unconsolidated, occasional poorly consolidated, predominantly clean, slightly calcareous,



occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut

- 8220-8230 Sandstone gray to translucent to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, abundant siltstone gray to dark gray, occasional brown, sub blocky to sub platy, moderately firm, sandy in part, slightly calcareous, occasional shale gray to dark gray, sub platy, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 8230-8240 Sandstone white to gray to translucent, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone gray to dark gray, occasional brown, sub blocky to sub platy, moderately firm, sandy in part, very calcareous, occasional shale gray to dark gray, sub platy, moderately soft, calcareous, no stain, fluorescence, or cut
- 8240-8250 Sandstone white to gray to translucent, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, abundant siltstone gray to dark gray, occasional reddish brown, sub blocky to sub platy, moderately firm, some calcareous, occasional shale gray to dark gray to green, some yellow, sub platy, moderately soft, calcareous, trace mineral fluorescence, no stain or cut
- 8250-8260 Sandstone white to gray to translucent, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, abundant siltstone a/a, occasional shale a/a, trace mineral fluorescence, no stain or cut
- 8260-8270 Sandstone white to translucent, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, occasional siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8270-8280 Sandstone white to translucent, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8280-8290 Sandstone white to translucent, abundant salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8290-8300 Sandstone white to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8300-8310 Sandstone white to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8310-8320 Siltstone brown to dark brown, some reddish brown, sub blocky, moderately firm, slightly calcareous, occasional sandstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8320-8330 Siltstone brown to dark brown, some reddish brown, sub blocky, moderately firm, slightly calcareous, abundant sandstone a/a, trace shale a/a, slight dull orange fluorescence, no stain or cut
- 8330-8340 Sandstone white to gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, very calcareous, occasional siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8340-8350 Sandstone white to gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous,

abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut

- 8350-8360 Sandstone white to gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8360-8370 Sandstone white to gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, occasional shale a/a, trace pyrite inclusion, slight dull orange fluorescence, no stain or cut
- 8370-8380 Sandstone white to gray to translucent, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, slight dull orange fluorescence, no stain or cut
- 8380-8390 Sandstone white to translucent, some salt and pepper, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8390-8400 Sandstone white to translucent, some salt and pepper, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, slight dull orange fluorescence, no stain or cut ✓
- 8400-8410 Sandstone white to translucent to light gray, some salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8410-8420 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8420-8430 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8430-8440 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, some dull yellow fluorescence, no stain or cut
- 8440-8450 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace siltstone a/a, trace shale a/a, trace carbonaceous shale with pyrite inclusions, no stain, fluorescence, or cut
- 8450-8460 Sandstone white to translucent to light gray, some pink, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, occasional shale gray to green, sub blocky, moderately firm, carbonaceous in part, trace siltstone a/a, slight dull orange fluorescence, no stain or cut
- 8460-8470 Sandstone white to translucent to light gray, some pink, some salt and pepper, fine to very fine grained, some medium grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, trace shale gray to green, sub blocky, moderately firm, carbonaceous in part, trace siltstone a/a, slight dull orange fluorescence, no stain or cut
- 8470-8480 Sandstone translucent to white to light gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very slightly calcareous, trace siltstone gray to reddish brown to brown, sub blocky, moderately firm, very

slightly calcareous, no stain, fluorescence, or cut

- 8480-8490 Sandstone translucent to white to light gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very slightly calcareous, trace siltstone gray to reddish brown to brown, sub blocky, moderately firm, very slightly calcareous, no stain, fluorescence, or cut
- 8490-8500 Siltstone dark gray, occasional light gray, rare reddish brown to brown, sub blocky, moderately firm, sandy, very slightly calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 8500-8510 Siltstone dark gray, occasional light gray, rare reddish brown to brown, sub blocky, moderately firm, sandy, very slightly calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 8510-8520 Siltstone dark gray, occasional light gray, rare reddish brown to brown, sub blocky, moderately firm, sandy, very slightly calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 8520-8530 Siltstone dark gray, occasional light gray, rare reddish brown to brown, sub blocky, moderately firm, sandy, very slightly calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 8530-8540 Siltstone dark gray, occasional light gray, rare reddish brown to brown, sub blocky, moderately firm, sandy, very slightly calcareous, some sandstone a/a, no stain, fluorescence, or cut
- 8540-8550 Sandstone translucent to white to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, very slightly calcareous, some siltstone gray to brown, sub blocky, moderately firm, very slightly calcareous, occasional shale gray, sub platy, moderately firm, no stain, fluorescence, or cut
- 8550-8560 Sandstone translucent to white to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, very slightly calcareous, some siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8560-8570 Sandstone translucent to white to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, very slightly calcareous, some siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8570-8580 Sandstone white to light gray to translucent, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, non calcareous, occasional siltstone dark gray, occasional brown to reddish brown, sub blocky to blocky, moderately firm, very slightly calcareous, trace shale a/a, no stain, fluorescence, or cut
- 8580-8590 Sandstone white to translucent to light gray, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone dark gray, occasional brown to reddish brown, sub blocky to blocky, moderately firm, calcareous, trace shale a/a, no stain, fluorescence, or cut
- 8590-8600 Sandstone white to translucent to light gray, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8600-8610 Sandstone white to translucent to light gray, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated to poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8610-8620 Sandstone white to translucent to light gray, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated to poorly consolidated, poorly sorted, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut

- 8620-8630 Sandstone white to translucent to light gray, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8630-8640 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8640-8650 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, no stain, fluorescence, or cut
- 8650-8660 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone gray to brown, occasional dark gray, rare reddish brown, sub blocky to blocky, moderately firm, calcareous, trace shale gray to dark gray, sub platy, calcareous, no stain, fluorescence, or cut
- 8660-8670 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8670-8680 Siltstone medium to dark gray, occasional brown, rare yellow, sub blocky to blocky, moderately firm, calcareous, some sandstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8680-8690 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8690-8700 Siltstone medium to dark gray, occasional brown, rare yellow, sub blocky to blocky, moderately firm, calcareous, some sandstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8700-8710 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8710-8720 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone gray to brown, occasional dark gray, rare reddish brown, sub blocky to blocky, moderately firm, calcareous, trace shale gray to dark gray, sub platy, calcareous, no stain, fluorescence, or cut
- 8720-8730 Sandstone white to translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, predominantly clean, very calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 8730-8740 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine good, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, occasional shale light to dark gray, some green, carbonaceous in part, sub blocky to sub platy, moderately hard, sandy in part, trace siltstone brown to dark brown, some red brown, sub blocky, slight dull orange fluorescence, no stain or cut

- 8740-8750 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant shale light to dark gray, some green, sub blocky to sub platy, moderately hard, sandy in part, trace siltstone a/a, slight dull orange fluorescence, no stain or cut
- 8750-8760 Shale a/a, abundant sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated, some unconsolidated, poorly sorted, occasional siltstone a/a, slight dull orange fluorescence, no stain or cut
- 8760-8770 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant shale a/a, trace siltstone a/a, slightly dull orange fluorescence, no stain or cut
- 8770-8780 Siltstone brown to dark brown, some red brown, sub blocky, moderately firm to firm, calcareous, occasional shale a/a, some sandstone a/a, slight dull orange fluorescence, no stain or cut
- 8780-8790 Siltstone brown to dark brown, some red brown, sub blocky, moderately firm to firm, calcareous, occasional shale a/a, carbonaceous in part, occasional sandstone a/a, no stain, fluorescence, or cut
- 8790-8800 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, occasional shale a/a, slight dull orange fluorescence, no stain or cut
- 8800-8810 Siltstone brown to dark brown, some red brown, sub blocky, hard, calcareous, abundant sandstone a/a, occasional shale a/a, slight dull orange fluorescence, no stain or cut
- 8810-8820 Sandstone white to translucent to light gray, abundant limestone quartz grains, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, occasional siltstone a/a, occasional shale a/a, trace carbonaceous shale, no stain, fluorescence, or cut
- 8820-8830 Sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant shale a/a, occasional siltstone a/a, some dull orange fluorescence, no stain or cut
- 8830-8840 Siltstone brown to dark brown, some red brown, sub blocky, hard, calcareous, occasional sandstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 8840-8850 Siltstone brown to dark brown, some red brown, sub blocky, hard, calcareous, occasional shale a/a, trace sandstone a/a, slight dull orange fluorescence, no stain or cut
- 8850-8860 Siltstone brown to dark brown, slightly red brown, sub blocky, hard, calcareous, trace shale a/a, trace sandstone a/a, slight dull orange fluorescence, no stain or cut
- 8860-8870 Sandstone white to translucent to light gray, abundant limestone quartz grains, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, abundant siltstone a/a, abundant shale a/a, slight dull orange fluorescence, no stain or cut
- 8870-8880 Siltstone brown to dark brown, slightly red brown, sub blocky, hard, calcareous, trace shale light to dark gray, sub platy, moderately hard, trace sandstone white to translucent to light gray, salt and pepper in part, fine to very fine grained, sub angular to sub rounded, poorly consolidated,

poorly sorted, very calcareous, no stain, fluorescence, or cut

8880-8890 Shale light gray to gray green, sub platy, hard, sandy in part, occasional sandstone a/a, occasional siltstone a/a, slight dull yellow fluorescence, no stain or cut

8890-8900 Siltstone brown to dark brown, slightly red brown, sub blocky, hard, calcareous, trace shale a/a, trace sandstone a/a, slight dull orange fluorescence, no stain or cut

8900-8910 Sandstone white to gray to translucent to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, occasional poorly consolidated, poorly sorted, calcareous, some siltstone dark gray, occasional black, trace brown, sub blocky, moderately firm, calcareous, trace shale dark gray to black, sub platy, moderately soft to firm, calcareous, no stain, fluorescence, or cut

8910-8920 Siltstone dark gray to black, occasional brown to reddish brown, rare grain to yellow, sub blocky to blocky, moderately firm to hard, sandy in part, calcareous, some sandstone a/a, some shale a/a, rare limestone off white to cream, moderately firm, slightly argillaceous, no stain, fluorescence, or cut

8920-8930 Siltstone a/a, abundant sandstone white to gray to translucent to salt and pepper, very fine to fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, very calcareous, occasional shale dark gray to black, platy to sub platy, moderately soft to moderately firm, pyrite laminations, slightly calcareous, no stain, fluorescence, or cut

8930-8940 Siltstone a/a, abundant sandstone white to gray to translucent to salt and pepper, very fine to fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, some shale dark gray to black, platy to sub platy, moderately soft to moderately firm, slightly calcareous, no stain, fluorescence, or cut

8940-8950 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, pyrite laminations, slightly calcareous, occasional sandstone a/a, some shale a/a, no stain, fluorescence, or cut

8950-8960 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, slightly calcareous, occasional sandstone a/a, some shale a/a, no stain, fluorescence, or cut

8960-8970 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, pyrite laminations, non calcareous, some sandstone a/a, some shale a/a, no stain, fluorescence, or cut

8970-8980 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, slightly calcareous, occasional sandstone a/a, some shale a/a, no stain, fluorescence, or cut

8980-8990 Siltstone gray to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky, moderately firm to hard, sandy in part, pyrite laminated, non calcareous, some shale light to medium gray to dark gray to black, occasional brown, platy to sub platy, moderately soft to firm, pyrite laminated, non calcareous, occasional sandstone a/a, no stain, fluorescence, or cut

8990-9000 Siltstone a/a, some shale a/a, occasional sandstone a/a, no stain, fluorescence, or cut

9000-9010 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, slightly calcareous, some sandstone a/a, some shale a/a, no stain, fluorescence, or cut

- 9010-9020 Siltstone medium to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky moderately firm to hard, sandy in part, slightly calcareous, occasional sandstone a/a, some shale a/a, no stain, fluorescence, or cut
- 9020-9030 Siltstone gray to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky, moderately firm to hard, sandy in part, pyrite nodules, non calcareous, some shale light to medium gray to dark gray to black, occasional brown, platy to sub platy, moderately soft to firm, pyrite nodules, non calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 9030-9040 Siltstone gray to dark gray to black, occasional brown to reddish brown, rare yellow to green, sub blocky to blocky, moderately firm to hard, slightly calcareous, abundant shale light gray to dark gray, some gray to green, platy to sub platy to splintery, firm to hard, sandy in part non calcareous, rare sandstone a/a, no stain, fluorescence, or cut
- 9040-9050 Siltstone gray to black, occasional brown to reddish brown to tan, occasional yellow to green, sub blocky to blocky, moderately firm to hard, sandy in part, non to very slightly calcareous, abundant shale gray to black, occasional tan to yellow to green, sub platy to platy to splintery, moderately soft to firm, non calcareous, occasional sandstone a/a, no stain, fluorescence, or cut
- 9050-9060 Siltstone a/a, abundant shale a/a, some s/s a/a, no stain, fluorescence, or cut
- 9060-9070 Siltstone a/a, abundant shale a/a, abundant sandstone gray to translucent to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very slightly calcareous, no stain, fluorescence, or cut
- 9070-9080 Siltstone a/a, abundant shale a/a, abundant sandstone gray to translucent to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very slightly calcareous, trace pyrite, no stain, fluorescence, or cut
- 9080-9090 Sandstone white to translucent to gray, fine to very fine grained, occasional medium grained, sub rounded to sub angular, unconsolidated, occasional poorly consolidated, poorly sorted, very slightly calcareous, abundant siltstone a/a, some shale a/a, no stain, fluorescence, or cut
- 9090-9100 Shale light to dark gray, gray green, some yellow to green, sub blocky to sub platy, splintery in part, moderately firm, sandy in part, abundant sandstone white to translucent to light gray, salt and pepper in part, angular to sub rounded, moderately consolidated, poorly sorted, non calcareous, occasional siltstone a/a, trace limestone cream to light gray, hard, micritic, slight dull orange fluorescence, no stain or cut
- 9100-9110 Shale light to dark gray, gray green, some yellow to green, sub blocky to sub platy, splintery in part, moderately firm, sandy in part, abundant sandstone white to translucent to light gray, salt and pepper in part, angular to sub rounded, moderately consolidated, poorly sorted, non calcareous, occasional siltstone a/a, slight dull orange fluorescence, no stain or cut
- 9110-9120 Shale light to dark gray, gray to green, sub blocky to splintery, firm, sandy in part, carbonaceous in part, some sandstone a/a, occasional siltstone a/a, some calcareous, no stain, fluorescence, or cut
- 9120-9130 Shale light to dark gray, gray green, some yellow to green, sub blocky to splintery, firm, sandy in part, some sandstone a/a, occasional siltstone a/a, some calcareous, slight dull orange fluorescence, no stain or cut
- 9130-9140 Shale light to dark gray, gray to green, sub blocky to splintery, firm, sandy in part, some sandstone a/a, occasional siltstone a/a, some calcareous, slight dull orange fluorescence, no stain or cut

- 9140-9150 Shale light to dark gray, gray to green, sub blocky to splintery, firm, carbonaceous in part, pyrite laminations, some sandstone a/a, some pyrite nodules, occasional siltstone a/a, some calcareous, slight dull orange fluorescence, no stain or cut
- 9150-9160 Shale light to dark gray, gray to green, rare yellow to green, sub blocky to splintery, firm, sandy in part, some carbonaceous, some sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, very slightly calcareous, occasional siltstone, brown to dark brown, some red brown to light green, sub blocky, moderately firm, some calcareous, no stain, fluorescence, or cut
- 9160-9170 Sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to hard very slightly calcareous, abundant shale a/a, occasional siltstone a/a, slight dull orange fluorescence, no stain or cut
- 9170-9180 Sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to hard, very slightly calcareous, occasional shale a/a, occasional siltstone a/a, rare limestone light gray, hard, slight mineral fluorescence, no stain or cut
- 9180-9190 Sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to hard, some calcareous, occasional shale a/a, occasional siltstone a/a, rare limestone light gray, hard, slight dull orange fluorescence, no stain or cut
- 9190-9200 Sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to hard, non calcareous, occasional shale a/a, occasional siltstone a/a, slightly calcareous, slight dull orange fluorescence, no stain or cut
- 9200-9210 Sandstone white to translucent to light brown, salt and pepper, fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to hard, slightly calcareous, abundant shale a/a, occasional siltstone a/a, slightly calcareous, slight dull orange fluorescence, no stain or cut
- 9210-9220 Siltstone reddish brown to brown to gray, occasional dark gray to black, sub blocky to blocky, moderately firm, calcareous, some sandstone translucent to gray to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, non calcareous, occasional shale gray to dark gray, platy to sub platy, moderately soft, non to slightly calcareous, carbonaceous in part, no stain, fluorescence, or cut
- 9220-9230 Sandstone translucent to gray to white, occasional dark gray, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, non calcareous, abundant siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut
- 9230-9240 Siltstone brown to gray, occasional reddish brown, rare yellow, sub blocky to blocky, moderately firm, non to very slightly calcareous, pyrite laminations, abundant sandstone a/a, occasional shale a/a, trace coal fragments, no stain, fluorescence, or cut
- 9240-9250 Sandstone translucent to light gray to white, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, non calcareous, some siltstone brown to gray, occasional reddish brown, sub blocky to blocky, moderately firm to hard, non calcareous, occasional shale gray to brown, platy to sub platy, moderately soft to firm, non calcareous, carbonaceous in part, no stain, fluorescence, or cut
- 9250-9260 Sandstone translucent to light gray to white, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, non to very slightly calcareous, some



siltstone a/a, trace shale a/a, no stain, fluorescence, or cut

9260-9270 Sandstone translucent to light gray to white, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, non to slightly calcareous, some siltstone a/a, trace shale a/a, slight dull orange fluorescence, no stain or cut

9270-9280 Sandstone translucent to light brown to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, slightly calcareous, occasional siltstone a/a, trace shale a/a, trace coal fragments, slight dull orange fluorescence, no stain or cut

9280-9290 Sandstone translucent to light brown to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard to hard, calcareous, some siltstone a/a, trace shale a/a, trace coal fragments, slight dull orange fluorescence, no stain or cut

9290-9300 Sandstone translucent to light brown to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard to hard, no porosity, calcareous, abundant siltstone a/a, trace shale a/a, trace coal fragments, slight dull orange fluorescence, no stain or cut

9300-9310 Sandstone translucent to light gray to white, occasional dark gray, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, no porosity, non calcareous, abundant siltstone gray to brown, occasional reddish brown, sub blocky to blocky, moderately firm to hard, non to very slightly calcareous, trace shale gray to brown, platy to sub platy, moderately firm, non calcareous, trace dull orange mineral fluorescence, no stain or cut

9310-9320 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, no porosity, non calcareous, occasional siltstone gray to brown, occasional reddish brown, sub blocky to blocky, moderately firm to hard, slightly calcareous, trace shale gray to brown to green, platy to sub platy, moderately firm, sandy in part, non calcareous, rare coal fragments, no stain, fluorescence, or cut

9320-9330 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately firm, non calcareous, occasional siltstone a/a, non to slightly calcareous, rare shale, some pyrite inclusions, slight dull orange fluorescence, no stain or cut

9330-9340 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately firm, non calcareous, occasional siltstone a/a, non to slightly calcareous, rare shale, trace coal fragments, slight dull orange fluorescence, no stain or cut

9340-9350 Sandstone a/a, occasional siltstone a/a, trace shale a/a, carbonaceous in part, rare coal fragments, slight dull orange fluorescence, no stain or cut

9350-9360 Sandstone a/a, some siltstone a/a, trace shale a/a, carbonaceous in part, trace coal fragments, slight dull orange fluorescence, no stain or cut

9360-9370 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, no porosity, slightly calcareous, trace siltstone gray to brown, occasional reddish brown, sub blocky to blocky, moderately firm to hard, slightly calcareous, trace shale a/a, carbonaceous in part, no stain, fluorescence, or cut

9370-9380 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, no porosity, slightly calcareous, abundant siltstone gray to brown, occasional reddish brown, sub blocky to blocky, moderately firm to hard, slightly calcareous, trace shale a/a, carbonaceous in part, rare coal fragment, no

stain, fluorescence, or cut

- 9380-9390 Sandstone translucent to light gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately firm, slightly calcareous, occasional siltstone a/a, calcareous, trace shale a/a, carbonaceous in part, slight dull orange fluorescence, no stain or cut
- 9390-9400 Sandstone translucent to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately firm, slightly calcareous, some siltstone gray, occasional reddish brown, rare green to tan, sub blocky, moderately firm, slightly calcareous, rare shale gray, platy to sub platy, moderately soft to firm, non calcareous, carbonaceous in part, no stain, fluorescence, or cut
- 9400-9410 Shale medium to dark gray, green in part, sub blocky to sub platy, moderately firm to firm, sandy in part, non calcareous, carbonaceous in part, occasional siltstone dark gray, red brown in part, sub blocky, slightly calcareous, trace sandstone a/a, rare coal fragments, no stain, fluorescence, or cut
- 9410-9420 Siltstone a/a, occasional shale a/a, trace sandstone a/a, rare limestone light gray, micritic, rare coal fragments, slight mineral fluorescence, no stain or cut
- 9420-9430 Shale medium to dark gray, occasional light gray to tan, sub blocky to sub platy, moderately firm to hard, sandy in part, non calcareous, carbonaceous in part, abundant siltstone dark gray to black, rare reddish brown to brown, blocky to sub blocky, moderately firm to hard, non calcareous, trace sandstone translucent to white, very fine to fine grained, sub rounded to sub angular, consolidated, poorly sorted, no porosity, non calcareous, no stain, fluorescence, or cut
- 9430-9440 Siltstone a/a, abundant shale light to medium to dark gray, occasional black, platy to flaky, moderately soft, laminated in part, non calcareous, trace sandstone a/a, no stain, fluorescence, or cut
- 9440-9450 Siltstone dark gray to black, occasional light gray to tan to green, blocky, hard, sandy in part, non calcareous, abundant shale a/a, trace sandstone a/a, rare limestone buff, micritic, hard, no stain, fluorescence, or cut
- 9450-9460 Shale black, occasional gray, sub blocky to sub platy to flaky, moderately firm, occasional moderately soft, carbonaceous, non calcareous, abundant siltstone a/a, trace sandstone a/a, rare coal fragments, no stain, fluorescence, or cut
- 9460-9470 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, sandy in part, calcareous, abundant shale a/a, trace sandstone a/a, no stain, fluorescence, or cut
- 9470-9480 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, calcareous, abundant shale a/a, trace sandstone a/a, rare coal fragments, no stain, fluorescence, or cut
- 9480-9490 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, calcareous, abundant shale a/a, trace sandstone a/a, very slightly calcareous, no stain, fluorescence, or cut
- 9490-9500 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, calcareous, occasional shale a/a, rare pyrite inclusions, trace sandstone a/a, very slightly calcareous, no stain, fluorescence, or cut
- 9500-9510 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, calcareous, abundant shale a/a, trace sandstone a/a, very slightly

calcareous, rare coal fragments, no stain, fluorescence, or cut

9510-9520 Siltstone dark gray to black, occasional light gray to tan to green, rare yellow, sub blocky to blocky, moderately soft to firm, calcareous, abundant shale a/a, trace sandstone a/a, very slightly calcareous, rare limestone light gray, micritic, slight dull orange fluorescence, no stain or cut

9520-9530 Siltstone dark gray to black, occasional light gray to tan to green, sub blocky to blocky, moderately soft to firm, slightly calcareous, abundant shale a/a, trace sandstone a/a, very slightly calcareous, rare limestone light gray, micritic, slight dull orange fluorescence, no stain or cut

9530-9540 Siltstone dark gray to black, occasional light gray to tan to green, sub blocky to blocky, moderately soft to firm, slightly calcareous, abundant shale a/a, trace sandstone a/a, very slightly calcareous, no stain, fluorescence, or cut

9540-9550 Siltstone dark gray to black, occasional light gray to tan to green, sub blocky to blocky, moderately soft to firm, slightly calcareous, abundant shale a/a, trace sandstone a/a, very slightly calcareous, no stain, fluorescence, or cut

9550-9560 Siltstone medium to dark gray, occasional light gray to tan to brown to reddish brown, rare yellow, sub blocky to blocky, moderately firm, sandy in part, slightly calcareous, some shale gray to brown, platy to sub platy, moderately soft, laminated in part, very slightly calcareous, good trace sandstone translucent to gray to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, non calcareous, no stain, fluorescence, or cut

9560-9570 Siltstone a/a, abundant shale gray to brown to black, sub platy to sub blocky, moderately soft to moderately firm, silty in part, carbonaceous in part, non calcareous, trace sandstone a/a, no stain, fluorescence, or cut

9570-9580 Siltstone gray to brown to green, occasional tan, rare white, blocky to sub blocky, moderately firm, sandy in part, non calcareous, some shale a/a, trace sandstone a/a, rare calcareous cement, no stain, fluorescence, or cut

9580-9590 Siltstone gray to brown to green, occasional tan, blocky to sub blocky, moderately firm, sandy in part, non calcareous, some shale a/a, trace sandstone a/a, rare calcareous cement, no stain, fluorescence, or cut

9590-9600 Siltstone medium to dark gray, occasional light gray to tan to brown to reddish brown, rare yellow, sub blocky to blocky, moderately firm, sandy in part, slightly calcareous, some shale gray to brown, platy to sub platy, moderately soft, carbonaceous in part, non calcareous, good trace sandstone translucent to gray to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare calcareous cement, no stain, fluorescence, or cut

9600-9610 Siltstone a/a, some shale a/a, good trace sandstone translucent to gray, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, non to very slightly calcareous, rare coal fragments, no stain, fluorescence, or cut

9610-9620 Siltstone a/a, some shale a/a, occasional pyrite nodules, good trace sandstone translucent to gray, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, non to very slightly calcareous, rare coal fragments, no stain, fluorescence, or cut

9620-9630 Siltstone medium to dark gray, occasional light gray to tan to brown to reddish brown to green, rare yellow, sub blocky to blocky, moderately firm, sandy in part, non calcareous, some shale gray to brown, platy to sub platy, moderately soft, carbonaceous in part, non calcareous, trace sandstone translucent to gray to white, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, occasional coal fragments, no stain, fluorescence, or cut

- 9630-9640 Siltstone a/a, some shale a/a, rare pyrite inclusions, trace sandstone translucent to gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, occasional coal fragments, rare limestone gray, micritic, slight mineral fluorescence, no stain or cut
- 9640-9650 Siltstone a/a, some shale medium gray to green, sub blocky to platy, moderately firm to hard, sandy in part, trace sandstone a/a, occasional coal fragments, rare pyrite inclusions, rare limestone cream to gray, micritic, no stain, fluorescence, or cut
- 9650-9660 Siltstone dark gray to dark brown, occasional light brown to reddish brown, sub blocky, moderately firm, slightly calcareous, occasional shale a/a, trace sandstone a/a, trace coal fragments, no stain, fluorescence, or cut
- 9660-9670 Siltstone dark gray to dark brown, occasional light brown to reddish brown, rare yellow, sub blocky, moderately firm, very slightly calcareous, occasional shale a/a, trace sandstone a/a, trace coal fragments, rare limestone cream to light gray, micritic, no stain, fluorescence, or cut
- 9670-9680 Siltstone dark gray to dark brown, occasional light brown to reddish brown, rare yellow, sub blocky, moderately firm, non calcareous, occasional shale a/a, trace sandstone a/a, trace calcareous, trace coal fragments, no stain, fluorescence, or cut
- 9680-9690 Siltstone dark gray to dark brown, occasional light brown to reddish brown, rare yellow, sub blocky, moderately firm, slightly calcareous, occasional shale a/a, trace sandstone a/a, trace calcareous, trace coal fragments, no stain, fluorescence, or cut
- 9690-9700 Shale medium to dark gray, some light green, sub blocky to sub platy, moderately firm to hard, sandy in part, abundant siltstone a/a, occasional sandstone a/a, occasional coal fragments, rare limestone cream, hard, micritic, slight dull orange fluorescence, no stain or cut
- 9700-9710 Siltstone light to medium gray to reddish brown, rare yellow, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant shale gray to brown, rare white, flaky to platy, moderately soft to firm, silty in part, laminated in part, carbonaceous in part, non calcareous, trace sandstone fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, non calcareous, good trace coal fragments, no stain, fluorescence, or cut
- 9710-9720 Siltstone a/a, abundant shale a/a, trace sandstone fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, very slightly calcareous, trace coal fragments, no stain, fluorescence, or cut
- 9720-9730 Siltstone light to medium gray to brown to green, occasional reddish brown, rare yellow to tan, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant shale a/a, trace sandstone a/a, good trace coal fragments, no stain, fluorescence, or cut
- 9730-9740 Siltstone light to medium gray to brown, occasional tan to reddish brown, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant shale gray to brown, rare white, flaky to platy, moderately soft to firm, laminated in part, carbonaceous in part, non calcareous, occasional sandstone white to translucent to gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated to friable, poorly sorted, non calcareous, rare coal fragments, no stain, fluorescence, or cut
- 9740-9750 Siltstone a/a, abundant shale a/a, trace sandstone a/a, trace coal fragments, no stain, fluorescence, or cut
- 9750-9760 Siltstone light to medium gray, occasional dark gray to black to brown to reddish brown, sub blocky to blocky, moderately firm, sandy in part, pyrite nodules in part, very slightly calcareous, abundant shale a/a, trace sandstone a/a, trace coal fragments, rare limestone light to medium gray,

micritic, hard, argillaceous in part, no stain, fluorescence, or cut

9760-9770 Siltstone light to medium gray to green, occasional dark gray to black to brown to reddish brown, sub blocky to blocky, moderately firm, sandy in part, non calcareous, abundant shale a/a, trace sandstone a/a, occasional coal fragments, no stain, fluorescence, or cut

9770-9780 Siltstone light to medium gray, occasional dark gray to black to brown to reddish brown, sub blocky to blocky, moderately firm, sandy in part, non calcareous, abundant shale a/a, trace sandstone a/a, rare coal fragments, no stain, fluorescence, or cut

9780-9790 Siltstone light to medium gray, occasional dark gray to black to brown to reddish brown, sub blocky to blocky, moderately firm, non calcareous, abundant shale a/a, trace sandstone a/a, rare coal fragments, rare limestone dark gray to brown, hard, sandy in part, slight dull orange fluorescence, no stain or cut

9790-9800 Shale dark to medium gray, some light green, sub blocky to sub platy, moderately firm, sandy in part, carbonaceous in part, abundant siltstone a/a, trace sandstone a/a, rare coal fragments, rare limestone a/a, no stain, fluorescence, or cut

9800-9810 Shale dark to medium gray, some light green, sub blocky to sub platy, moderately firm, sandy in part, carbonaceous in part, abundant siltstone a/a, trace sandstone translucent to white, salt and pepper in part, fine to very fine grained, rare coarse grained translucent quartz, poorly consolidated to friable, non calcareous, rare coal fragments, rare limestone cream, hard, sandy in part, no stain, fluorescence, or cut

9810-9820 Shale a/a, occasional siltstone a/a, trace sandstone translucent to white, salt and pepper in part, fine to very fine grained, poorly consolidated to friable, slightly calcareous, rare coal fragments, slight mineral fluorescence, no stain or cut

9820-9830 Shale dark to medium gray, some light green, sub blocky to sub platy, moderately firm to hard, sandy in part, carbonaceous in part, slightly calcareous, occasional siltstone a/a, slightly calcareous, rare sandstone a/a, trace coal fragments, rare limestone cream to light brown, micritic, no stain, fluorescence, or cut

9830-9840 Siltstone light to medium gray to brown, occasional tan to reddish brown to green, sub blocky to blocky, moderately firm to hard, sandy in part, very slightly calcareous, abundant shale gray to brown to green, flaky to platy, moderately soft to firm, carbonaceous in part, non calcareous, trace sandstone white to translucent to gray, salt and pepper in part, very fine to fine grained, sub rounded to sub angular, poorly consolidated to friable, poorly sorted, non calcareous, rare coal fragments, rare limestone buff to gray, micritic, no stain, fluorescence, or cut

9840-9850 Shale a/a, abundant siltstone a/a, trace sandstone a/a, rare limestone a/a, no stain, fluorescence, or cut

9850-9860 Siltstone light to medium gray to brown, occasional tan to reddish brown to green, sub blocky to blocky, moderately firm to hard, sandy in part, calcareous, abundant shale a/a, good trace sandstone white to translucent to gray, salt and pepper in part, very fine to fine grained, sub rounded to sub angular, poorly consolidated to friable, poorly sorted, calcareous in part, good trace coal fragments, rare limestone buff to gray, micritic, no stain, fluorescence, or cut

9860-9870 Shale a/a, abundant siltstone light to medium gray to reddish brown, occasional green, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, trace sandstone a/a, occasional coal fragments, no stain, fluorescence, or cut

9870-9880 Shale medium to dark gray, some light green, sub blocky to platy, moderately firm, sandy in part, carbonaceous in part, non calcareous, abundant siltstone light to medium gray to reddish brown, some tan to green, sub blocky to platy, moderately firm to hard, slightly calcareous, trace

sandstone a/a, rare limestone cream, micritic, occasional coal fragments, no stain, fluorescence, or cut

9880-9890 Siltstone gray to brown, occasional reddish brown to green, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant sandstone translucent to gray to salt and pepper, fine to very fine grained, rare medium grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately hard, non calcareous, some shale a/a, no stain, fluorescence, or cut

9890-9900 Siltstone a/a, slightly to very calcareous, abundant sandstone a/a, calcareous cement, some shale a/a, very slightly calcareous, trace coal fragments, no stain, fluorescence, or cut

9900-9910 Sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately hard, non calcareous, abundant siltstone a/a non calcareous, occasional shale a/a non calcareous, rare dull orange mineral fluorescence, no stain or cut

9910-9920 Sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately hard, non calcareous, abundant siltstone a/a, non calcareous, occasional shale a/a, non calcareous, pyrite laminations and nodules, rare dull orange mineral fluorescence, no stain or cut

9920-9930 Sandstone translucent to white to gray to salt and pepper, fine to medium grained, sub rounded to sub angular to angular, poorly consolidated, poorly sorted, moderately hard, non calcareous, abundant siltstone a/a, non calcareous, occasional shale a/a, non calcareous, rare coal fragments, no stain, fluorescence, or cut

9930-9940 Sandstone a/a, some siltstone a/a, occasional shale a/a, no stain, fluorescence, or cut

9940-9950 Sandstone translucent to white to gray to salt and pepper, medium to fine grained, sub rounded to sub angular to angular, consolidated, poorly sorted, moderately hard, non porosity, rare pyrite nodules, occasional siltstone a/a, slightly calcareous, trace shale a/a, non calcareous, rare limestone cream to light gray, hard, micritic, slight mineral fluorescence, no stain or cut

9950-9960 Sandstone translucent to white to gray to salt and pepper, medium to fine grained, sub rounded to sub angular to angular, consolidated, poorly sorted, moderately firm, very slightly calcareous, occasional siltstone a/a, slightly calcareous, trace shale a/a, non calcareous, trace coal fragments, no stain, fluorescence, or cut

9960-9970 Sandstone a/a, occasional siltstone a/a, occasional coal fragments, trace shale a/a, no stain, fluorescence, or cut

9970-9980 Sandstone translucent to white to gray to salt and pepper, medium to fine grained, some very fine grained, sub rounded to sub angular to angular, consolidated, poorly sorted, moderately firm, very slightly calcareous, occasional siltstone a/a, occasional shale, trace coal fragments, slight mineral fluorescence, no stain or cut

9980-9990 Sandstone translucent to white to gray to salt and pepper, medium to fine grained, some very fine grained, sub rounded to sub angular to angular, consolidated, poorly sorted, moderately firm, non calcareous, occasional siltstone a/a, occasional shale a/a, rare coal fragments, slight mineral fluorescence, no stain or cut

9990-10000 Sandstone a/a, occasional siltstone a/a, trace shale a/a, rare coal fragments, rare limestone light gray, hard, micritic, no stain, fluorescence, or cut

- 10000-10010 Sandstone a/a, occasional siltstone a/a, trace shale a/a, rare coal fragments, slight mineral fluorescence, no stain or cut
- 10010-10020 Sandstone translucent to white to gray to salt and pepper, medium to fine grained, some very fine grained, sub rounded to sub angular to angular, consolidated, poorly sorted, firm, no porosity, occasional siltstone a/a, trace shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10020-10030 Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately hard, non calcareous, abundant siltstone gray to brown, occasional reddish brown to tan to green, rare yellow, sub blocky to blocky, moderately firm, sandy in part, non calcareous, some shale gray to brown, sub platy, moderately firm, silty in part, carbonaceous in part, non calcareous, trace coal fragments, no stain, fluorescence, or cut
- 10030-10040 Sandstone a/a, some siltstone a/a, occasional shale a/a, rare limestone light to medium gray, hard, micritic, rare coal fragments, no stain, fluorescence, or cut
- 10040-10050 Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, moderately hard, non calcareous, occasional siltstone gray to brown, occasional reddish brown to tan to green, rare yellow, sub blocky to blocky, moderately firm, very slightly calcareous, some shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10050-10060 Sandstone a/a, occasional shale medium to dark gray, some light green, sub blocky to platy, moderately firm to soft, sandy in part, carbonaceous in part, trace siltstone a/a, rare coal fragments, slight mineral fluorescence, no stain or cut
- 10060-10070 Sandstone translucent to cream to white, some gray, salt and pepper, medium to fine grained, some coarse grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately hard, no porosity, some clay cement, some pyrite nodules, occasional shale medium to dark gray, some light green, sub blocky to sub platy, moderately firm to soft, sandy in part, non calcareous, carbonaceous in part, occasional siltstone a/a, trace coal fragments, no stain, fluorescence, or cut
- 10070-10080 Sandstone translucent to white, some gray to salt and pepper, coarse to medium grained, some fine to very fine grained, angular to sub rounded, moderately consolidated, poorly sorted, moderately hard, no porosity, very slightly calcareous, some pyrite nodules, some shale a/a, trace siltstone a/a, rare coal fragments, no stain, fluorescence, or cut
- 10080-10090 Sandstone a/a, abundant shale a/a, occasional siltstone a/a, trace coal fragments, no stain, fluorescence, or cut
- 10090-10100 Siltstone gray to brown, occasional reddish brown to tan, rare yellow, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant sandstone a/a, occasional shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10100-10110 Siltstone gray to brown, occasional reddish brown to tan, rare yellow, sub blocky to blocky, moderately firm to hard, sandy in part, non calcareous, abundant shale a/a, some disseminated pyrite, occasional sandstone a/a, some pyrite nodules, rare limestone cream to buff, rare coal fragments, no stain, fluorescence, or cut
- 10110-10120 Siltstone gray to brown, occasional reddish brown to tan, sub blocky to blocky, moderately firm to hard, sandy in part, very slightly calcareous, abundant shale a/a, some disseminated pyrite, occasional sandstone a/a, trace coal fragments, rare limestone cream to buff, no stain, fluorescence, or cut
- 10120-10130 Siltstone gray to brown, occasional reddish brown to tan, sub blocky to sub platy, moderately firm to hard, sandy in part, calcareous, occasional shale a/a, some disseminated pyrite, pyrite

nodules, occasional sandstone a/a, trace coal fragments, slight mineral fluorescence, no stain or cut

10130-10140 Siltstone gray to brown, occasional reddish brown to tan, sub blocky to sub platy, moderately firm to hard, sandy in part, calcareous, occasional shale a/a, some disseminated pyrite, occasional sandstone a/a, trace coal fragments, slight mineral fluorescence, no stain or cut

10140-10150 Siltstone a/a, occasional shale a/a, some sandstone a/a, rare coal fragments, no stain, fluorescence, or cut

10150-10160 Siltstone medium to dark gray to black, occasional tan to brown, rare reddish brown, sub blocky to blocky, moderately firm, sandy in part, non calcareous, occasional shale gray to brown, sub platy to sub blocky, moderately firm, occasional pyrite laminations, carbonaceous in part, silty in part, non calcareous, some sandstone translucent to gray to salt and pepper, fine to very fine grained, poorly consolidated, poorly sorted, moderately hard, non calcareous, no stain, fluorescence, or cut

10160-10170 Siltstone a/a, slightly calcareous, some shale a/a, occasional sandstone a/a, no stain, fluorescence, or cut

10170-10180 Siltstone medium to dark gray to black, occasional tan to brown, sub blocky to blocky, moderately firm, very sandy in part, calcareous, occasional shale gray to brown, sub platy to sub blocky, moderately firm, carbonaceous in part, silty in part, calcareous, some sandstone translucent to gray to salt and pepper, fine to very fine grained, poorly consolidated, poorly sorted, moderately hard, non calcareous, no stain, fluorescence, or cut

10180-10190 Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately hard, slightly calcareous, occasional siltstone a/a, trace shale a/a, no stain, fluorescence, or cut

10190-10200 Siltstone medium to dark gray, rare green to tan, sub blocky to blocky, moderately firm, very sandy, calcareous, some shale a/a, some sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, slightly calcareous, trace coal fragments, no stain, fluorescence, or cut

10200-10210 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, very sandy, very calcareous, some shale a/a, some sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, very calcareous, trace coal fragments, no stain, fluorescence, or cut

10210-10220 Siltstone a/a, abundant sandstone a/a, some shale a/a, no stain, fluorescence, or cut

10220-10230 Sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, non to slightly calcareous, abundant siltstone medium to dark gray, occasional black to brown, sub blocky to blocky, moderately firm, very sandy, calcareous, some shale gray to brown, rare white, platy to sub platy, moderately soft, carbonaceous in part, non calcareous, no stain, fluorescence, or cut

10230-10240 Sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, slightly calcareous, abundant siltstone a/a, some shale gray to brown, platy to sub platy, moderately soft, carbonaceous in part, non calcareous, occasional coal fragments, no stain, fluorescence, or cut

10240-10250 Sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, slightly calcareous, abundant siltstone a/a, some shale gray to brown, platy to sub platy, moderately soft, carbonaceous in part, non



calcareous, occasional coal fragments, no stain, fluorescence, or cut

10250-10260 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, very sandy, very calcareous, some shale a/a, some sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, calcareous, trace coal fragments, no stain, fluorescence, or cut

10260-10270 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, very sandy, very calcareous, some shale medium to dark gray to dark brown, some light green, sub blocky to platy, moderately firm to soft, sandy in part, carbonaceous in part, some sandstone a/a, trace coal fragments, no stain, fluorescence, or cut

10270-10280 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, calcareous, some shale medium to dark gray to dark brown, some light green, sub blocky to platy, moderately firm to soft, sandy in part, carbonaceous in part, some sandstone a/a, trace coal fragments, no stain, fluorescence, or cut

10280-10290 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, some laminated, calcareous, abundant coal black, hard, sub vitreous, good cleating, visible degas, some shale a/a, some carbonaceous, trace pyrite laminations, some sandstone a/a, no stain, fluorescence, or cut

10290-10300 Siltstone medium to dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, calcareous, occasional coal a/a, some shale a/a, some carbonaceous, trace sandstone translucent to white to salt and pepper, angular to sub rounded, medium to fine grained, poorly sorted, consolidated, calcareous, no stain, fluorescence, or cut

10300-10310 Siltstone a/a, occasional shale a/a, carbonaceous in part, some sandstone a/a, trace coal fragments, no stain, fluorescence, or cut

10310-10320 Sandstone translucent to gray to light brown to salt and pepper, medium to very fine grained, angular to sub rounded, consolidated, some loose grains, non calcareous, abundant siltstone a/a, some shale a/a, trace coal fragments, no stain, fluorescence, or cut

10320-10330 Sandstone translucent to gray to light brown to salt and pepper, medium to very fine grained, angular to sub rounded, poorly consolidated, abundant loose grains, non calcareous, occasional siltstone a/a, some shale a/a, trace coal fragments, no stain, fluorescence, or cut

10330-10340 Siltstone medium to dark gray, rare light gray to tan, sub blocky to sub platy, moderately firm, calcareous, abundant sandstone a/a, some shale a/a, some carbonaceous, trace coal fragments, slight dull orange fluorescence, no stain or cut

10340-10350 Siltstone medium to dark gray, rare light gray to tan, sub blocky to sub platy, moderately firm, calcareous, abundant sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, some shale a/a, some carbonaceous, occasional coal fragments, slight dull orange fluorescence, no stain or cut

13050-10360 Siltstone medium to dark gray, rare light gray to tan, sub blocky to sub platy, moderately firm, calcareous, abundant coal black, moderately firm, sub vitreous, some shale a/a, some carbonaceous, trace sandstone a/a, no stain, fluorescence, or cut

10360-10370 Siltstone medium to dark gray, occasional light gray to tan, rare yellow, sub blocky to blocky, moderately firm, sandy, slightly calcareous, some shale medium to dark gray, platy to sub blocky, moderately soft, carbonaceous in part, slightly calcareous, occasional sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to friable, calcareous cement, trace coal fragments, no stain, fluorescence, or

cut

- 10370-10380 Siltstone a/a, abundant coal black, moderately hard, sub vitreous, conchoidal fracture, visible degas, some shale a/a, trace sandstone a/a, no stain, fluorescence, or cut
- 10380-10390 Siltstone a/a, some coal a/a, some shale a/a, occasional sandstone a/a, no stain, fluorescence, or cut
- 10390-10400 Siltstone medium to dark gray, occasional light gray to tan to white, rare green, sub blocky to blocky, moderately firm, sandy, calcareous, some coal a/a, some shale a/a, occasional sandstone a/a, no stain, fluorescence, or cut
- 10400-10410 Siltstone a/a, some shale a/a, trace sandstone a/a, abundant coal fragments, no stain, fluorescence, or cut
- 10410-10420 Siltstone medium to dark gray, occasional light gray to tan, rare green, sub blocky to blocky, moderately firm, sandy, slightly calcareous, some shale a/a, trace sandstone a/a, occasional coal fragments, no stain, fluorescence, or cut
- 10420-10430 Siltstone a/a, some shale a/a, trace sandstone a/a, abundant coal fragments, no stain, fluorescence, or cut
- 10430-10440 Coal black, hard, sub vitreous, occasional siltstone medium to dark gray to brown, some reddish brown, sub blocky to sub platy, calcareous, some shale a/a, abundant loose quartz grains, coarse to medium grains, no stain, fluorescence, or cut
- 10440-10450 Siltstone medium to dark gray, occasional light gray to tan, occasional reddish brown, sub blocky to sub platy, moderately firm, calcareous, some shale a/a, occasional loose quartz medium to coarse grains, trace coal fragments, no stain, fluorescence, or cut
- 10450-10460 Siltstone medium to dark gray, occasional light gray, sub blocky to blocky, moderately hard, sandy in part, calcareous, some sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, non calcareous, occasional shale gray, sub platy to sub blocky, moderately firm, carbonaceous in part, non calcareous, abundant coal fragments (cavings?), no stain, fluorescence, or cut
- 10460-10470 Siltstone a/a, abundant sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, unconsolidated, rare poorly consolidated, poorly sorted, non calcareous, some shale a/a, abundant coal fragments (cavings?), no stain, fluorescence, or cut
- 10470-10480 Sandstone translucent to gray to white, fine to very fine grained, sub rounded to rounded to sub angular, unconsolidated, non calcareous, abundant siltstone a/a, some shale a/a, abundant coal fragments, no stain, fluorescence, or cut
- 10480-10490 Sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately firm, slightly calcareous, abundant siltstone light to medium gray, occasional tan to reddish brown, sub blocky to blocky, moderately firm, sandy in part, slightly calcareous, occasional shale gray, sub platy to platy, moderately soft to firm, silty in part, very slightly calcareous, abundant coal fragments, rare limestone buff, hard, micritic, no stain, fluorescence, or cut
- 10490-10500 Sandstone translucent to white to gray, fine to very fine grained, sub rounded to sub angular, unconsolidated to poorly consolidated, poorly sorted, calcareous, abundant siltstone a/a, some shale a/a, abundant coal fragments, no stain, fluorescence, or cut

- 10500-10510 Sandstone a/a, abundant siltstone a/a, some shale a/a, occasional coal fragments, rare limestone buff, hard, micritic, no stain, fluorescence, or cut
- 10510-10520 Sandstone a/a, abundant siltstone a/a, some shale a/a, trace coal fragments, no stain, fluorescence, or cut
- 10520-10530 Siltstone a/a, abundant sandstone a/a, some shale a/a, trace coal fragments, no stain, fluorescence, or cut
- 10530-10540 Sandstone translucent to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately hard, calcareous, abundant siltstone light to medium gray, occasional tan to reddish brown, sub blocky to blocky, moderately firm, sandy in part, calcareous, occasional shale gray, sub platy to platy, moderately soft to firm, silty in part, slightly calcareous, rare coal fragments, no stain, fluorescence, or cut
- 10540-10550 Siltstone medium to dark gray, occasional light gray to tan to reddish brown, sub blocky to blocky, moderately firm, very sandy, pyrite nodules, calcareous, abundant sandstone a/a, some shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10550-10560 Siltstone medium to dark gray, occasional light gray to tan to reddish brown, sub blocky to blocky, moderately firm, very sandy, calcareous, some shale a/a, trace sandstone a/a, rare coal fragments, no stain, fluorescence, or cut
- 10560-10570 Siltstone medium to dark gray, occasional light gray to tan to reddish brown, sub blocky to blocky, moderately firm, sandy in part, calcareous, occasional sandstone translucent to white to light gray to salt and pepper, medium to fine to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, slightly calcareous, rare shale a/a, trace coal fragments, no stain, fluorescence, or cut
- 10570-10580 Siltstone a/a, occasional sandstone translucent to white to light gray, salt and pepper in part, medium to fine to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, slightly calcareous, occasional shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10580-10590 Siltstone a/a, occasional sandstone a/a, occasional shale a/a, trace coal fragments, no stain, fluorescence, or cut
- 10590-10600 Siltstone reddish brown to medium gray, occasional dark gray, rare light gray to tan, sub blocky to blocky, moderately firm, sandy in part, slightly calcareous, some shale gray to brown, sub platy to sub blocky, moderately firm, silty in part, carbonaceous in part, slightly calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, very slightly calcareous cement, rare dull orange mineral fluorescence, no stain or cut
- 10600-10610 Siltstone dark gray to black, occasional reddish brown to medium gray, rare yellow to green to tan, sub blocky to blocky, moderately firm, very sandy, slightly calcareous, some shale a/a, occasional sandstone a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut
- 10610-10620 Siltstone a/a, some shale a/a, occasional sandstone a/a, no stain, fluorescence, or cut
- 10620-10630 Sandstone gray to translucent to salt and pepper, very fine to fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, very calcareous, abundant siltstone a/a, some shale a/a, no stain, fluorescence, or cut
- 10630-10640 Sandstone medium to dark gray to translucent to salt and pepper, very fine to fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, very calcareous, abundant

siltstone a/a, some shale a/a, no stain, fluorescence, or cut

10640-10650 Siltstone light to medium gray to dark brown, occasional reddish brown, sub blocky to sub platy, moderately firm, sandy in part, calcareous, abundant sandstone a/a, rare shale light gray to light green, sub blocky, moderately firm, sandy in part, non calcareous, rare coal fragments, slight mineral fluorescence, no stain or cut

10650-10660 Siltstone light to medium gray to dark brown, occasional reddish brown, sub blocky to sub platy, moderately firm, very sandy, calcareous, rare pyrite nodules, occasional sandstone light gray to white to some translucent, salt and pepper in part, fine to very fine grained, sub rounded to rounded, moderately sorted, moderately consolidated, silty in part, calcareous, rare shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut

10660-10670 Siltstone a/a, occasional sandstone a/a, rare shale a/a, trace coal fragments, no stain, fluorescence, or cut

10670-10680 Siltstone light to medium gray to dark brown, occasional reddish brown, sub blocky to sub platy, moderately firm, very sandy, calcareous, occasional sandstone a/a, rare shale a/a, trace coal fragments, no stain, fluorescence, or cut

10680-10690 Siltstone light to medium gray to dark brown, occasional reddish brown, sub blocky to sub platy, moderately firm, calcareous, rare pyrite nodules, very sandy, grading to sandstone, occasional sandstone a/a, rare shale a/a, rare coal fragments, no stain, fluorescence, or cut

10690-10700 Siltstone light to medium gray to dark brown, occasional reddish brown, sub blocky to sub platy, moderately firm, calcareous, rare disseminated pyrite, very sandy, grading to sandstone, abundant sandstone light gray to translucent to white, salt and pepper in part, fine to very fine grained, some medium to fine grained, angular to sub rounded, moderately to poorly sorted, moderately consolidated, calcareous cement, silty in part, rare shale a/a, rare coal fragments, slight mineral fluorescence, no stain or cut

10700-10710 Sandstone translucent to white to light gray to salt and pepper, sub angular to sub rounded, medium to fine grained, moderately consolidated, poorly sorted, silty in part, calcareous, abundant siltstone medium gray to dark brown, some reddish brown, sub blocky to sub platy, moderately firm, very calcareous, sandy in part, trace shale a/a, trace coal fragments, no stain, fluorescence, or cut ✓

10710-10720 Sandstone a/a, abundant siltstone a/a, rare pyrite nodules, trace shale a/a, trace coal fragments, no stain, fluorescence, or cut

10720-10730 Sandstone a/a, some very fine grained, abundant siltstone a/a, trace shale a/a, trace coal fragments, some cavings, no stain, fluorescence, or cut

10730-10740 Sandstone a/a, some very fine grained, abundant siltstone a/a, rare shale a/a, trace coal fragments, some cavings, no stain, fluorescence, or cut

10740-10750 Sandstone a/a, some very fine grained, occasional siltstone a/a, rare shale a/a, trace coal fragments, no stain, fluorescence, or cut ✓

10750-10760 Sandstone a/a, very calcareous, some siltstone a/a, rare carbonaceous shale, rare coal fragments, no stain, fluorescence, or cut

10760-10770 Sandstone a/a, very calcareous, grading to siltstone, some siltstone a/a, rare shale a/a, rare coal fragments, no stain, fluorescence, or cut

- 10770-10780 Sandstone a/a, some very fine grained, very calcareous, grading to siltstone, abundant siltstone a/a, rare shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10780-10790 Sandstone a/a, some very fine grained, some loose quartz coarse grains, very calcareous, grading to siltstone, abundant siltstone a/a, rare shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 10790-10800 Sandstone a/a, some very fine grained, some loose quartz coarse grains, very calcareous, grading to siltstone, abundant siltstone a/a, rare shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut
- 10800-10810 Siltstone light to medium gray to dark brown, rare reddish brown, sub blocky to sub platy, moderately firm, calcareous, very sandy, grading to sandstone, abundant sandstone light gray to translucent to white, salt and pepper in part, fine to very fine grained, some medium to fine grained, sub angular to sub rounded, poorly sorted, moderately to poorly consolidated, calcareous, silty in part, rare shale a/a, no stain, fluorescence, or cut
- 10810-10820 Siltstone light to medium gray to dark brown, sub blocky to sub platy, moderately firm, calcareous, very sandy, grading to sandstone, occasional sandstone light gray to translucent to white, salt and pepper in part, fine to very fine grained, some medium to fine grained, sub angular to sub rounded, poorly sorted, moderately to poorly consolidated, silty in part, rare shale a/a, carbonaceous in part, no stain, fluorescence, or cut
- 10820-10830 Sandstone translucent to white to gray, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, occasional unconsolidated, poorly sorted, slightly calcareous, abundant siltstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 10830-10840 Sandstone translucent to white to gray, occasional salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately firm to hard, very calcareous, abundant siltstone medium to dark gray, occasional tan to brown, sub blocky to blocky, moderately firm to hard, very sandy, grading to sandstone in part, calcareous, rare shale a/a, no stain, fluorescence, or cut
- 10840-10850 Poor sample, bypassing shakers Siltstone a/a, some sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 10850-10860 Siltstone dark gray to black, sub blocky to blocky, moderately firm to hard, very sandy, grading to sandstone in part, very calcareous, some sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 10860-10870 Siltstone dark gray to black, sub blocky to blocky, moderately firm to hard, very sandy, grading to sandstone in part, very calcareous, abundant disseminated pyrite and pyrite nodules, some sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 10870-10880 Siltstone dark gray to black, sub blocky to blocky, moderately firm to hard, very sandy, grading to sandstone in part, very calcareous, occasional disseminated pyrite and pyrite nodules, some sandstone translucent to white to light gray to salt and pepper, angular to sub rounded, fine to very fine grained, some medium to fine grained, moderately to poorly consolidated, poorly sorted, very calcareous, trace shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut
- 10880-10890 Siltstone dark gray to black, sub blocky to blocky, moderately firm to hard, very sandy, grading to sandstone in part, very calcareous, occasional disseminated pyrite and pyrite nodules, carbonaceous in part, some sandstone a/a, rare shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut

- 10890-10900 Siltstone a/a, some disseminated pyrite, grading to sandstone in part, carbonaceous in part, very calcareous, abundant sandstone a/a, rare shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut
- 10900-10910 Siltstone a/a, some pyrite nodules, grading to sandstone in part, carbonaceous in part, very calcareous, abundant sandstone a/a, silty in part, calcareous, trace shale a/a, rare coal fragments (cavings?), no stain, fluorescence, or cut
- 10910-10920 Siltstone a/a, occasional disseminated pyrite and pyrite nodules, grading to sandstone in part, carbonaceous in part, slightly calcareous, abundant sandstone a/a, calcareous, trace shale, variegated, sub blocky to blocky, moderately firm, sub waxy, sandy in part, some coal fragments, no stain, fluorescence, or cut
- 10920-10930 Siltstone a/a, grading to sandstone in part, carbonaceous in part, slightly calcareous, abundant coal, black, earthy to sub vitreous, hard, some pyrite nodules, abundant sandstone a/a, calcareous, trace shale a/a, no stain, fluorescence, or cut
- 10930-10940 Siltstone a/a, grading to sandstone in part, carbonaceous in part, slightly calcareous, abundant sandstone a/a, calcareous, occasional coal black, earthy to sub vitreous, hard, trace shale a/a, no stain, fluorescence, or cut
- 10940-10950 Sandstone translucent to white to light gray, salt and pepper in part, medium to fine grained, moderately to poorly consolidated, poorly sorted, no porosity, hard, silty in part, very calcareous, abundant siltstone a/a, grading to sandstone in part, some disseminated pyrite, slightly calcareous, occasional shale a/a, some coal fragments, slight mineral fluorescence, no stain or cut
- 10950-10960 Sandstone a/a, abundant siltstone a/a, grading to sandstone in part, very slightly calcareous, occasional shale a/a, some coal fragments, no stain, fluorescence, or cut
- 10960-10970 Sandstone a/a, abundant siltstone a/a, grading to sandstone in part, very slightly calcareous, occasional shale a/a, some coal fragments, no stain, fluorescence, or cut
- 10970-10980 Sandstone a/a, abundant siltstone a/a, grading to sandstone in part, very slightly calcareous, occasional shale a/a, some pyrite inclusions, some coal fragments, no stain, fluorescence, or cut
- 10980-10990 Siltstone medium to dark gray to gray to brown, some reddish brown, sub blocky to blocky, moderately firm to hard, very sandy, carbonaceous in part, slightly calcareous, some disseminated pyrite, abundant shale variegated, sub blocky to sub platy, hard, sub waxy, sandy in part, non calcareous, occasional sandstone translucent to white to light gray to salt and pepper, medium to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, very calcareous, rare coal fragments, slight mineral fluorescence, no stain or cut
- 10990-11000 Siltstone medium to dark gray to gray brown, some reddish brown, sub blocky to blocky, moderately firm to hard, very sandy, carbonaceous in part, slightly calcareous, some pyrite nodules, abundant shale a/a, occasional sandstone a/a, rare coal fragments, slight mineral fluorescence, no stain or cut
- 11000-11010 Siltstone medium to dark gray to gray brown, some reddish brown, sub blocky to blocky, moderately firm to hard, very sandy, carbonaceous in part, slightly calcareous, grading to sandstone, occasional sandstone a/a, trace shale a/a, rare coal fragments, slight mineral fluorescence, no stain or cut
- 11010-11020 Siltstone a/a, grading to sandstone, occasional sandstone a/a, trace shale a/a, rare coal fragments, no stain, fluorescence, or cut
- 11020-11030 Siltstone medium to dark gray to gray brown, some reddish brown, sub blocky to blocky, moderately firm, very sandy, grading to sandstone, carbonaceous in part, calcareous, trace

sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, slightly calcareous, trace shale a/a, no stain, fluorescence, or cut

- 11030-11040 Siltstone a/a, very calcareous, grading to sandstone, trace sandstone, translucent to gray to brown, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, slightly calcareous, rare shale a/a, no stain, fluorescence, or cut
- 11040-11050 Siltstone a/a, very calcareous, grading to sandstone, some pyrite inclusions, trace sandstone a/a, rare shale, no stain, fluorescence, or cut
- 11050-11060 Siltstone a/a, very calcareous, grading to sandstone, some pyrite inclusions, rare sandstone a/a, rare shale, no stain, fluorescence, or cut
- 11060-11070 Siltstone a/a, very calcareous, some grading to sandstone, rare sandstone a/a, rare shale, no stain, fluorescence, or cut
- 11070-11080 Siltstone a/a, very calcareous, some grading to sandstone, trace sandstone translucent to light gray, some brown, medium to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, rare shale, no stain, fluorescence, or cut
- 11080-11090 Siltstone a/a, very calcareous, some grading to sandstone, trace sandstone translucent to light gray, fine to very fine grained, sub angular to sub rounded, poorly sorted, moderately consolidated, rare shale, no stain, fluorescence, or cut
- 11090-11100 Siltstone medium to dark gray, sub blocky to sub platy, soft to moderately soft, very sandy, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11100-11110 Siltstone a/a, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11110-11120 Siltstone a/a, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11120-11130 Siltstone a/a, good trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11130-11140 Siltstone medium to dark gray, sub blocky to sub platy, soft to moderately soft, very sandy, very calcareous, some pyrite nodules, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11140-11150 Siltstone medium to dark gray, rare brown to reddish brown, sub blocky to sub platy, soft to moderately soft, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11150-11160 Siltstone medium to dark gray, sub blocky to sub platy, soft to moderately soft, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11160-11170 Siltstone medium to dark gray, sub blocky to sub platy, moderately firm, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11170-11180 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut

- 11180-11190 Siltstone medium to dark gray, sub blocky to sub platy, moderately firm, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11190-11200 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, trace sandstone a/a, rare shale a/a, no stain, fluorescence, or cut
- 11200-11220 Siltstone dark gray to black, occasional medium gray, rare light gray, sub blocky to sub platy, moderately soft, very sandy, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11220-11240 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11240-11260 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, rare dull orange mineral fluorescence, no stain or cut
- 11260-11280 Siltstone medium to dark gray, rare brown, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11280-11300 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, rare shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11300-11320 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, trace shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11320-11340 Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, trace shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11340-11360 Siltstone medium to dark gray, rare brown, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, occasional shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut
- 11360-11380 Siltstone medium to dark gray, rare brown, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone



translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, occasional shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut

11380-11400 Siltstone medium to dark gray, rare brown, sub blocky to sub platy, moderately soft to moderately firm, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, occasional shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut

11400-11420 Siltstone medium to dark gray, rare brown, sub blocky to sub platy, soft to moderately soft, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, occasional shale dark gray, platy to sub platy, moderately soft, silty, calcareous, no stain, fluorescence, or cut

11420-11440 Sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, some medium grained, sub angular to sub rounded, moderately consolidated, poorly sorted, hard, very calcareous, abundant siltstone a/a, rare shale dark gray to variegated, sub platy, moderately firm, very calcareous, no stain, fluorescence, or cut

11440-11460 Sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, some medium grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, moderately firm to soft, very calcareous, abundant siltstone medium to dark gray to dark brown, sub blocky to sub platy, moderately firm to soft, very sandy, very calcareous, grading to sandstone in part, rare shale dark gray to variegated, sub blocky, moderately firm, very calcareous, no stain, fluorescence, or cut

11460-11480 Siltstone medium to dark gray to dark brown, sub blocky to sub platy, moderately firm to soft, very sandy, very calcareous, grading to sandstone, abundant sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, moderately firm, no stain, fluorescence, or cut

11480-11500 Siltstone medium to dark gray to dark brown, some red brown, sub blocky to sub platy, moderately firm to soft, very sandy, very calcareous, grading to sandstone, abundant sandstone translucent to white to light gray to salt and pepper, some brown, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, moderately firm calcareous, rare shale a/a, no stain, fluorescence, or cut

11500-11520 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, some medium grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, moderately firm, calcareous, rare shale a/a, no stain, fluorescence, or cut

11520-11540 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to brown, salt and pepper in part, fine to very fine grained, some medium grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, moderately firm, calcareous, rare pyrite inclusions, rare shale a/a, no stain, fluorescence, or cut

11540-11560 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately soft to soft, very sandy, carbonaceous in part, rare pyrite nodules, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately to

poorly sorted, moderately firm, calcareous, rare shale a/a, no stain, fluorescence, or cut

- 11560-11580 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately soft to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, moderately soft, calcareous, rare shale medium gray, sub platy, moderately firm, calcareous, no stain, fluorescence, or cut
- 11580-11600 Siltstone medium to dark gray to dark brown, sub blocky to sub platy, moderately firm, very sandy, carbonaceous in part, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, firm, calcareous, rare shale medium gray, sub platy, moderately firm, calcareous, no stain, fluorescence, or cut
- 11600-11620 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to blocky, moderately firm, very sandy, carbonaceous in part, very calcareous, grading to sandstone, abundant sandstone translucent to white to medium gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, firm, calcareous, no stain, fluorescence, or cut
- 11620-11640 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to blocky, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, firm, calcareous, rare shale light gray, splintery, earthy, calcareous, no stain, fluorescence, or cut
- 11640-11660 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to blocky, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, firm, calcareous, no stain, fluorescence, or cut
- 11660-11680 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, moderately soft, calcareous, rare shale light gray, splintery, earthy, calcareous, no stain, fluorescence, or cut
- 11680-11700 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm, very sandy, carbonaceous in part, very calcareous, grading to sandstone, trace sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, consolidated, moderately to poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 11700-11720 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, moderately to poorly sorted, moderately firm, calcareous, slight mineral fluorescence, no stain or cut
- 11720-11740 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to brown to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, moderately firm, calcareous, rare shale medium gray, sub platy, sub waxy, slight mineral

fluorescence, no stain or cut

- 11740-11760 Siltstone medium to dark gray to dark brown, sub blocky to platy, soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, abundant sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, moderately to poorly sorted, firm, calcareous, no stain, fluorescence, or cut
- 11760-11780 Siltstone medium to dark gray to dark brown, rare red brown, sub blocky to sub platy, moderately firm, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately to poorly sorted, hard, calcareous, no stain, fluorescence, or cut
- 11780-11800 Siltstone medium to dark gray to dark brown, sub blocky to sub platy, moderately firm to soft, very sandy, carbonaceous in part, very calcareous, grading to sandstone, occasional sandstone translucent to white to light gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, moderately to poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 11800-11820 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11820-11840 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11840-11860 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11860-11880 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11880-11900 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, occasional shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11900-11920 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, occasional shale gray, rare black, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut

- 11920-11940 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm in part, slightly calcareous, occasional shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 11940-11960 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, trace coal fragments, no stain, fluorescence, or cut
- 11960-11980 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, trace coal fragments, no stain, fluorescence, or cut
- 11980-12000 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, trace coal fragments, no stain, fluorescence, or cut
- 12000-12020 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, trace translucent calcite crystals, rare coal fragments, no stain, fluorescence, or cut
- 12020-12040 Siltstone medium gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 12040-12060 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 12060-12080 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 12080-12100 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular to angular, unconsolidated, poorly sorted, slightly calcareous, trace shale gray, platy to sub platy, soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 12100-12120 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, soft, very sandy, carbonaceous in part, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub

rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, no stain, fluorescence, or cut

- 12120-12140 Siltstone medium gray, occasional dark gray to red brown, sub blocky to sub platy, moderately firm to firm, very sandy, carbonaceous in part, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to brown to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare shale medium gray, blocky, hard, sandy in part, calcareous, no stain, fluorescence, or cut
- 12140-12160 Siltstone medium gray, occasional dark gray to red brown, sub blocky to sub platy, moderately firm to firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare shale medium gray, blocky, hard, sandy in part, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12160-12180 Siltstone medium gray, occasional dark gray to red brown, sub blocky to sub platy, moderately firm to firm, very sandy, carbonaceous in part, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, moderately firm, calcareous, rare shale medium gray, blocky, hard, sandy in part, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12180-12200 Siltstone medium gray, occasional dark gray, sub blocky to sub platy, moderately firm to firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, rare shale medium gray, blocky, hard, sandy in part, calcareous, no stain, fluorescence, or cut
- 12200-12220 Siltstone medium gray, blocky to sub blocky, moderately firm to firm, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm, calcareous, rare shale medium gray, blocky, hard, sandy in part, calcareous, no stain, fluorescence, or cut
- 12220-12240 Siltstone medium gray, rare dark gray, blocky to sub blocky, firm, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, some sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 12240-12260 Siltstone medium gray, rare dark gray, blocky to sub blocky, firm, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12260-12280 Siltstone medium gray, some dark gray, blocky to sub blocky, soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, soft, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12280-12300 Siltstone medium gray, some dark gray, blocky to sub blocky, moderately firm, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to soft, calcareous, rare coal fragments, no stain, fluorescence, or cut

- 12300-12320 Siltstone medium gray, some dark gray, sub blocky to sub platy, moderately firm to soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to soft, calcareous, no stain, fluorescence, or cut
- 12320-12340 Siltstone medium gray, some dark gray, sub blocky to sub platy, moderately firm to soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated to poorly consolidated, poorly sorted, moderately firm to soft, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12340-12360 Siltstone medium gray to dark gray, blocky to sub blocky, moderately firm, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm to soft, calcareous, rare shale medium gray, sub blocky, firm, sandy, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12360-12380 Siltstone medium gray to dark gray, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, some sandstone translucent to white to gray to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm to soft, calcareous, rare shale medium gray, sub blocky, firm, sandy, earthy, calcareous, rare coal fragments, rare pyrite nodules, no stain, fluorescence, or cut
- 12380-12400 Siltstone medium gray to dark gray, rare red brown, sub blocky to sub platy, moderately firm to soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, some sandstone translucent to white to gray to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm to soft, calcareous, rare shale medium gray, sub blocky, firm, sandy, earthy, calcareous, rare coal fragments, rare pyrite nodules, no stain, fluorescence, or cut
- 12400-12420 Siltstone medium gray, some dark gray, blocky to sub blocky, moderately firm to soft, very sandy, slightly carbonaceous, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, rare shale medium gray, sub blocky, firm, sandy, earthy, calcareous, rare coal fragments, no stain, fluorescence, or cut
- 12420-12440 Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, trace shale gray, sub platy, moderately soft to moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut
- 12440-12460 Sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, abundant siltstone a/a, trace shale a/a, no stain, fluorescence, or cut
- 12460-12480 Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, trace shale gray, sub platy, moderately soft to moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut



consolidated, poorly sorted, moderately soft, calcareous, good trace shale medium to dark gray, sub platy to platy, moderately soft to moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12660-12680 Siltstone medium to dark gray, sub blocky to blocky, firm to moderately firm, sandy, carbonaceous in part, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately soft, calcareous, trace shale medium to dark gray, sub platy to platy to splintery, moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12680-12700 Siltstone medium to dark gray, rare red brown, sub blocky to sub platy, moderately firm to soft, sandy in part, carbonaceous in part, grading to sandstone in part, very calcareous, occasional sandstone translucent to white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately soft, calcareous, trace shale medium to dark gray, sub platy to platy to splintery, moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12700-12720 Siltstone medium to dark gray, blocky to sub blocky to sub platy, hard to moderately soft, sandy, laminated in part, grading to sandstone in part, very calcareous, occasional sandstone white to gray, translucent to salt and pepper in part, fine to very fine grained, some medium grained, sub angular to sub rounded, consolidated, poorly sorted, moderately firm, calcareous, rare shale medium to dark gray, platy to splintery, moderately firm, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12720-12740 Siltstone medium to dark gray, blocky to sub blocky to sub platy, moderately firm to soft, sandy, laminated in part, grading to sandstone in part, very calcareous, some sandstone white to gray to translucent to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, moderately firm to soft, calcareous, rare shale medium to dark gray, platy to splintery, soft, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12740-12760 Siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm to soft, sandy, grading to sandstone in part, rare carbonaceous, very calcareous, abundant sandstone white to gray to translucent to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, consolidated, poorly sorted, moderately firm to firm, calcareous, rare shale medium to dark gray, platy to splintery, soft, sandy to silty, slightly calcareous, no stain, fluorescence, or cut

12760-12780 Siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm to firm, sandy, grading to sandstone in part, very calcareous, abundant sandstone white to gray to translucent to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, consolidated, poorly sorted, moderately firm to firm, calcareous, good trace shale medium to dark gray, sub blocky to sub platy, very hard, rare carbonaceous, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut

12780-12800 Siltstone medium to dark gray, rare red brown, sub blocky to sub platy to platy, moderately firm to firm, sandy, grading to sandstone in part, carbonaceous in part, very calcareous, abundant sandstone white to gray to translucent to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, consolidated, poorly sorted, moderately firm to moderately soft, calcareous, trace shale medium to dark gray, sub platy, moderately firm to soft, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut

12800-12820 Sandstone white to gray to translucent to salt and pepper, fine to very fine grained, some loose medium grained quartz, sub angular to sub rounded, moderately consolidated to unconsolidated, poorly sorted, firm to hard, no porosity, very calcareous, abundant siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm, sandy, grading to sandstone in part, very calcareous, trace shale medium to dark gray, platy to splintery, moderately



soft, slightly calcareous, no stain, fluorescence, or cut

- 12820-12840 Sandstone white to gray to translucent to salt and pepper, fine to very fine grained, some loose medium grained quartz, sub angular to sub rounded, unconsolidated, some moderately consolidated, poorly sorted, moderately soft to soft, very calcareous, abundant siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm, sandy, grading to sandstone in part, very calcareous, rare shale light to medium gray, platy to splintery, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 12840-12860 Sandstone white to translucent to salt and pepper, some gray, fine to very fine grained, some loose medium grained quartz, sub angular to sub rounded, moderately consolidated to unconsolidated, poorly sorted, moderately soft to soft, calcareous, abundant siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm, sandy, grading to sandstone in part, very calcareous, rare shale light to medium gray, sub blocky, moderately soft, slightly calcareous, no stain, fluorescence, or cut
- 12860-12880 Siltstone medium to dark gray, rare red brown, sub blocky to sub platy to platy, moderately firm to soft, sandy, grading to sandstone in part, calcareous, abundant sandstone white to translucent to salt and pepper, some gray, fine to very fine good, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to moderately soft, calcareous, trace shale medium to dark gray, sub platy, soft, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut
- 12880-12900 Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, calcareous, abundant sandstone white to translucent to salt and pepper, some gray, fine to very fine grained, sub angular to sub rounded, moderately consolidated to unconsolidated, poorly sorted, moderately soft, calcareous, trace shale medium to dark gray, sub platy, moderately firm, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut
- 12900-12920 Siltstone medium to dark gray, sub blocky to sub platy to platy, moderately firm to soft, sandy, grading to sandstone in part, laminated in part, calcareous, abundant sandstone white to translucent to salt and pepper, some gray, fine to very fine good, sub angular to sub rounded, moderately consolidated, no porosity, unconsolidated in part, poorly sorted, moderately soft, calcareous, rare shale light gray, sub platy, moderately firm, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut
- 12920-12940 Siltstone medium to dark gray, sub blocky to sub platy to platy, moderately soft, sandy, grading to sandstone in part, laminated in part, calcareous, occasional sandstone white to translucent to salt and pepper, some gray, fine to very fine grained, sub angular to sub rounded, moderately consolidated to poorly consolidated, poorly sorted, moderately soft, calcareous, rare shale light gray, sub platy, moderately firm, sandy to silty in part, slightly calcareous, no stain, fluorescence, or cut
- 12940-12960 Siltstone medium gray, dark gray in part, sub blocky to sub platy, moderately firm, sandy, grading to sandstone in part, calcareous, occasional sandstone white to translucent to gray to salt and pepper, fine to very fine good, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm to firm, calcareous, no stain, fluorescence, or cut
- 12960-12980 No sample due to loss of returns/circulation
- 12980-13000 No sample to bypassing shaker to LCM only
- 13000-13020 No sample to bypassing shaker to LCM only
- 13020-13040 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white, fine to very fine grained, sub angular to sub rounded, moderately

consolidated to unconsolidated, firm, no porosity, calcareous, no stain, fluorescence, or cut

13040-13060 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, carbonaceous laminations in part, some grading to sandstone, very calcareous, trace sandstone translucent to gray to white, fine to very fine grained, sub angular to sub rounded, consolidated, very hard, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13060-13080 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, carbonaceous laminations in part, grading to sandstone, very calcareous, trace sandstone translucent to gray to white, fine to very fine grained, sub angular to sub rounded, consolidated, very hard, no porosity, some unconsolidated, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13080-13100 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, carbonaceous, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white, fine to very fine grained, sub angular to sub rounded, consolidated, very hard, no porosity, calcareous, no stain, fluorescence, or cut

13100-13120 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, moderately firm to soft, sandy, carbonaceous, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white, fine to very fine grained, sub angular to sub rounded, consolidated, very hard, no porosity, calcareous, no stain, fluorescence, or cut

13220-13140 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, no stain, fluorescence, or cut

13240-13160 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13260-13180 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately soft, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13280-13200 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately soft, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13200-13220 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13220-13240 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub

angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13240-13260 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13260-13280 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13280-13300 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13300-13320 Bypassing shakers, abundant LCM, Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, abundant siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13320-13340 Bypassing shakers, abundant LCM, Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, abundant siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13340-13360 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13360-13380 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13380-13400 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, very hard, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13400-13420 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft, sandy in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, some coarse to medium loose quartz grains, poorly consolidated, poorly sorted, soft, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

- 13420-13440 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to moderately soft, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, hard, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut
- 13440-13460 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to soft, sandy, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, some loose quartz grains, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, firm, calcareous, no stain, fluorescence, or cut
- 13460-13480 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to soft, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, no stain, fluorescence, or cut
- 13480-13500 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to soft, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, some coarse to medium quartz grains, sub rounded to sub angular, moderately consolidated, poorly sorted, firm to soft, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, rare pyrite nodules, no stain, fluorescence, or cut
- 13500-13520 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to soft, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, firm, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, rare pyrite nodules, no stain, fluorescence, or cut
- 13520-13540 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, firm to moderately firm, sandy, grading to sandstone, very calcareous, occasional sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, firm, no porosity, calcareous, rare shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut
- 13540-13560 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, rare sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, poorly sorted, firm, no porosity, calcareous, rare shale dark gray, sub platy, firm, silty, slightly calcareous, no stain, fluorescence, or cut
- 13560-13580 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, abundant loose coarse to medium quartz grains, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, soft, calcareous, rare shale dark gray, sub platy, firm, silty, slightly calcareous, no stain, fluorescence, or cut
- 13580-13600 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, soft, sandy, very calcareous, trace sandstone translucent to light gray to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, soft, calcareous, trace shale dark gray, sub platy, firm, silty, slightly calcareous, no stain, fluorescence, or cut
- 13600-13620 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, firm to moderately firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, angular to sub rounded,

moderately to poorly consolidated, poorly sorted, firm, calcareous, trace shale white to dark gray, sub platy, moderately firm to firm, silty in part, slightly calcareous, no stain, fluorescence, or cut

13620-13640 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, firm, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, firm, no porosity, calcareous, rare shale dark gray, sub platy, firm, silty, slightly calcareous, no stain, fluorescence, or cut

13640-13660 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, firm to moderately soft, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, firm, no porosity, calcareous, no stain, fluorescence, or cut

13660-13680 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, hard to firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, firm, no porosity, calcareous, rare shale black, sub blocky, slightly silty, hard, non calcareous, no stain, fluorescence, or cut

13680-13700 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, soft, sandy, very calcareous, rare sandstone translucent to gray to white to salt and pepper, fine to very fine grained, some loose quartz grains, sub angular to sub rounded, moderately consolidated, poorly sorted, moderately firm, no porosity, calcareous, no stain, fluorescence, or cut

13700-13720 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13720-13740 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13740-13760 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13760-13780 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13780-13800 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13800-13820 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone

translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13820-13840 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13840-13860 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13860-13880 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13880-13900 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13900-13920 Bypassing shakers, abundant LCM, Sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, abundant siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, trace shale dark gray, rare white, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13920-13940 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, very hard, no porosity, calcareous, trace shale dark gray, rare white, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13940-13960 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated to unconsolidated, poorly sorted, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13960-13980 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated to unconsolidated, poorly sorted, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

13980-14000 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, moderately firm to soft, sandy, grading to sandstone, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, calcareous, trace shale black, sub blocky, firm, sandy, non

calcareous, no stain, fluorescence, or cut

14000-14020 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, moderately soft, calcareous, rare shale black, sub blocky, firm, sandy, non calcareous, no stain, fluorescence, or cut

14020-14040 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, laminated in part, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, hard to soft, calcareous, no stain, fluorescence, or cut

14040-14060 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, hard to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, firm to soft, calcareous, rare shale black, sub blocky, firm, sandy, non calcareous, no stain, fluorescence, or cut

14060-14080 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, calcareous, trace shale black, sub blocky, firm, sandy, non calcareous, no stain, fluorescence, or cut

14080-14100 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, soft, calcareous, rare shale black, sub blocky, firm, sandy, non calcareous, no stain, fluorescence, or cut

14100-14120 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, moderately firm, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, firm, calcareous, rare shale black, sub blocky, firm, sandy, non calcareous, no stain, fluorescence, or cut

14120-14140 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub blocky, moderately firm, sandy, carbonaceous in part, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately to poorly consolidated, poorly sorted, firm, calcareous, no stain, fluorescence, or cut

14140-14160 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, moderately firm, sandy, carbonaceous in part, grading to sandstone, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, poorly sorted, hard, no porosity, calcareous, rare shale black, sub blocky, hard, sandy, non calcareous, no stain, fluorescence, or cut

14160-14180 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, soft, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, soft, calcareous, rare shale fragments black, sub blocky, hard, sandy, non calcareous, no stain, fluorescence, or cut

- 14180-14200 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, rare shale fragments black, sub blocky, hard, sandy, non calcareous, no stain, fluorescence, or cut
- 14200-14220 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, very calcareous, some sandstone translucent to gray to white to salt and pepper, calcareous, no stain, fluorescence, or cut
- 14220-14240 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, moderately firm, sandy, grading to sandstone in part, calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, rare shale fragments black, sub blocky, hard, sandy, non calcareous, no stain, fluorescence, or cut
- 14240-14260 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, rare red brown, blocky to sub platy, firm to moderately soft, sandy, grading to sandstone in part, calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, rare shale fragments black, sub blocky to platy, hard, sandy, non calcareous, no stain, fluorescence, or cut
- 14260-14280 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, moderately firm, sandy, grading to sandstone in part, calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, rare shale fragments black, sub blocky, hard, sandy, non calcareous, no stain, fluorescence, or cut
- 14280-14300 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, hard to soft, sandy, grading to sandstone in part, calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, no porosity, calcareous, no stain, fluorescence, or cut
- 14300-14320 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut
- 14320-14340 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut
- 14340-14360 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut
- 14360-14380 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut



14380-14400 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14400-14420 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14420-14440 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14440-14460 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14460-14480 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14480-14500 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, occasional black, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14500-14520 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14520-14540 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to firm, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14540-14560 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to firm, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14560-14580 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub

angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14580-14600 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, sub blocky to blocky, soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, moderately hard, calcareous, trace shale dark gray, sub platy, soft, silty, calcareous, no stain, fluorescence, or cut

14600-14620 Bypassing shakers, abundant LCM, Siltstone medium to dark gray, blocky to sub platy, moderately firm to firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, poorly sorted, hard, calcareous, trace shale dark gray to black, sub platy, firm, silty, slightly calcareous, no stain, fluorescence, or cut

14620-14640 Abundant LCM Poor sample. Siltstone medium gray to black, sub blocky, firm, sandy, some sandstone gray, fine grained, angular to sub angular, poorly consolidated, poorly sorted, slightly calcareous, no stain, fluorescence, or cut

14640-14660 Abundant LCM Siltstone medium to dark gray, blocky to sub blocky, soft to firm, sandy, grading to sandstone in part, very calcareous, occasional sandstone light gray to white to light tan to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately consolidated, moderately sorted, hard, calcareous, rare shale light gray to black, sub blocky, firm, sub waxy, earthy in part, non calcareous, no stain, fluorescence, or cut

14660-14680 Abundant LCM Siltstone medium to dark gray, blocky to sub platy, moderately firm to soft, sandy, laminated in part, grading to sandstone in part, very calcareous, abundant sandstone translucent to light gray to white to light tan to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, moderately consolidated, poorly sorted, firm, calcareous, some shale light gray, sub blocky, firm, sub waxy, silty in part, non calcareous, no stain, fluorescence, or cut

14680-14700 Abundant LCM Siltstone medium to dark gray, blocky to sub blocky, firm, sandy, grading to sandstone in part, very calcareous, some sandstone translucent to light gray to white to salt and pepper, fine to very fine grained, some medium grained, angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, soft, calcareous, rare shale gray, sub platy, firm, sub waxy, non calcareous, no stain, fluorescence, or cut

14700-14720 Abundant LCM Siltstone medium to dark gray, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately firm to firm, calcareous, good trace shale dark gray to black, sub platy to sub blocky, moderately soft, slightly calcareous, no stain, fluorescence, or cut

14720-14740 Abundant LCM Siltstone medium to dark gray, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately firm to firm, calcareous, occasional shale dark gray to black, sub platy to sub blocky, moderately soft, slightly calcareous, no stain, fluorescence, or cut

14740-14760 Abundant LCM Siltstone medium to dark gray, rare green, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, moderately firm to firm, calcareous, occasional shale dark gray to black, sub platy to sub blocky, moderately soft, slightly calcareous, no stain, fluorescence, or cut

- 14760-14780 Abundant LCM Siltstone medium to dark gray, rare green, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, trace shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 14780-14800 Abundant LCM Siltstone medium to dark gray, rare green, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, trace shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 14800-14820 Abundant LCM Siltstone medium to dark gray to black, occasional light gray, rare green, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, trace shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 14820-14840 Abundant LCM Siltstone medium to dark gray to black, occasional light gray, rare green, blocky to sub blocky, firm to moderately firm, very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, trace shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, no stain, fluorescence, or cut
- 14840-14860 Abundant LCM Siltstone dark gray to black, occasional light gray, rare tan to green, blocky to sub blocky, moderately soft to firm, sandy to very sandy, very calcareous, some shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, no stain, fluorescence, or cut
- 14860-14880 Abundant LCM Siltstone dark gray to black, rare tan, blocky to sub blocky, moderately soft to firm, sandy to very sandy, very calcareous, some shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, rare limestone off white to buff, moderately firm, micritic, no stain, fluorescence, or cut
- 14880-14900 Abundant LCM Siltstone dark gray to black, rare green, blocky to sub blocky, moderately soft to firm, sandy to very sandy, very calcareous, some shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately soft to moderately firm, calcareous, no stain, fluorescence, or cut
- 14900-14920 Abundant LCM Siltstone dark gray to black, rare light gray, blocky to sub blocky, soft to moderately soft, sandy, very calcareous, some shale dark gray to black, sub platy to sub blocky, moderately soft, silty, slightly calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, moderately firm to moderately hard, calcareous, no stain, fluorescence, or cut

- 14920-14940 Abundant LCM Siltstone medium to dark gray to black, rare tan to light gray, blocky to sub platy, moderately soft, sandy, rare grading to sandstone, very calcareous, some shale light to medium gray, rare black, sub blocky, moderately soft, silty, slightly calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 14940-14960 Abundant LCM Siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm, sandy, very calcareous, some shale light to medium gray to black, blocky to sub blocky, firm, silty, sub waxy, slightly calcareous, rare sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 14960-14980 Abundant LCM Siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm, sandy, rare grading to sandstone, very calcareous, some shale light gray to black, blocky to sub blocky, firm, silty in part, sub waxy in part, slightly calcareous, rare sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, moderately to poorly consolidated, poorly sorted, hard, calcareous, no stain, fluorescence, or cut
- 14980-15000 Abundant LCM Siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm to firm, sandy, very calcareous, occasional shale light gray to white, sub blocky to platy, firm to moderately firm, silty in part, sub waxy in part, slightly calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, poorly consolidated to unconsolidated, poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 15000-15020 Abundant LCM Siltstone medium to dark gray, rare black to light green, sub blocky to platy, moderately firm, sandy, very calcareous, occasional shale light to medium gray, blocky to sub blocky, firm to moderately firm, silty in part, sub waxy in part, slightly calcareous, trace sandstone white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, hard, calcareous, no stain, fluorescence, or cut
- 15020-15040 Abundant LCM Siltstone medium to dark gray, sub blocky to platy, moderately soft to moderately firm, sandy, grading to sandstone in part, very calcareous, occasional shale light to medium gray, rare green to white, blocky to sub blocky, firm, silty in part, sub waxy in part, slightly calcareous, trace sandstone white to gray to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, hard, calcareous, no stain, fluorescence, or cut
- 15040-15060 Abundant LCM Shale light to medium gray to white to green, blocky to sub blocky to splintery, firm, silty in part, sub waxy in part, slightly calcareous, occasional siltstone medium to dark gray, rare black, blocky to sub blocky, moderately firm, sandy, slightly calcareous, trace sandstone translucent to white to gray to salt and pepper, medium grained, angular to sub angular, moderately consolidated, poorly sorted, moderately firm, calcareous, no stain, fluorescence, or cut
- 15060-15080 Abundant LCM Shale light to dark gray to white to green, rare black, blocky to sub blocky to splintery, firm, silty in part, sub waxy in part, non calcareous, abundant siltstone medium to dark gray, rare black, sub blocky to sub platy, moderately firm, sandy, calcareous, rare sandstone translucent to white to gray to salt and pepper, medium grained, sub angular to sub rounded, unconsolidated, poorly sorted, soft, no stain, fluorescence, or cut
- 15080-15100 Abundant LCM Shale black to dark gray, platy to flaky to splintery, hard to very hard, silty in part, calcareous, abundant siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm, sandy to very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, firm to moderately hard, calcareous, rare bright

yellow and dull orange mineral fluorescence, no stain or cut

15100-15120 Abundant LCM Shale black to dark gray, platy to flaky to splintery, moderately firm, silty in part, calcareous, some siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm, sandy to very sandy, grading to sandstone in part, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare dull orange mineral fluorescence, no stain or cut

15120-15140 Abundant LCM Shale black to dark gray, sub blocky to sub platy, moderately firm to hard, silty in part, calcareous, some siltstone medium to dark gray to black, sub blocky to sub platy, moderately firm, sandy to very sandy, grading to sandstone in part, very calcareous, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare dull orange mineral fluorescence, no stain or cut

15140-15160 Abundant LCM Shale black to dark gray, sub blocky to sub platy, moderately soft to firm, occasional hard, silty in part, very calcareous, some siltstone medium to dark gray to black, rare white to tan, sub blocky to sub platy, moderately firm, sandy to very sandy, grading to sandstone in part, very calcareous, good trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, rare dull orange mineral fluorescence, no stain or cut

15160-15180 Abundant LCM Shale black to dark gray, some light gray, blocky to sub blocky, firm, silty in part, very calcareous, abundant siltstone medium to dark gray to black, rare red brown, sub blocky to sub platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately sorted, hard, calcareous, no stain, fluorescence, or cut

15180-15200 Abundant LCM Siltstone medium to dark gray to black to red brown, some green, sub blocky to platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, abundant shale black to dark gray, some light gray to green, blocky to sub blocky, firm, silty in part, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, moderately consolidated, moderately sorted, hard, calcareous, no stain, fluorescence, or cut

15200-15220 Abundant LCM Siltstone medium to dark gray to black, rare red brown, sub blocky to platy, moderately firm to soft, sandy, grading to sandstone in part, very calcareous, occasional shale light to dark gray to black, sub blocky, firm, silty in part, calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, moderately sorted, firm to moderately soft, calcareous, no stain, fluorescence, or cut

15220-15240 Abundant LCM Siltstone medium to dark gray to black, sub blocky to platy, moderately firm to soft, sandy to very sandy, grading to sandstone in part, very calcareous, occasional shale light to dark gray to black, some green, sub blocky to sub platy, firm, silty to sandy in part, calcareous, rare sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated, moderately sorted, hard, calcareous, no stain, fluorescence, or cut

15240-15260 Abundant LCM Shale medium to dark gray to black, some light gray, blocky to sub blocky, firm, silty in part, calcareous, some siltstone medium to dark gray to black, some red brown, blocky to sub platy, firm to soft, sandy, very calcareous, trace sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub rounded to sub angular, consolidated to unconsolidated, poorly sorted, hard, very calcareous, no stain, fluorescence, or cut

- 15260-15280 Shale dark gray to black, occasional medium gray, sub platy to platy to sub blocky, soft to moderately firm, silty, calcareous, abundant siltstone medium to dark gray, occasional black, trace red brown, sub blocky to blocky, moderately firm, sandy in part, calcareous, abundant loose sandstone grained translucent to white to gray, fine to medium grained, sub rounded to sub angular, non calcareous, rare pyrite, abundant dull orange mineral fluorescence, no stain or cut
- 15280-15300 Abundant LCM Shale medium to dark gray to black, some green to light gray, sub blocky to sub platy to splintery, hard, silty in part, slightly calcareous, abundant siltstone medium to dark gray to black, trace red brown, sub blocky to sub platy, firm to soft, sandy, very calcareous, some sandstone translucent to gray to white to salt and pepper, fine to very fine grained, abundant loose sandstone translucent to white, medium grained, angular to sub rounded, consolidated to unconsolidated, poorly sorted, hard, very calcareous, no stain, fluorescence, or cut
- 15300-15320 Siltstone medium to dark gray to black, sub blocky to platy, moderately firm, sandy to very sandy, grading to sandstone in part, calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, moderately firm to firm, very calcareous, occasional shale light to dark gray to black, some green, sub blocky to sub platy to splintery, hard, silty in part, slightly calcareous to non calcareous, no stain, fluorescence, or cut
- 15320-15340 Abundant LCM Siltstone medium to dark gray to black, sub blocky to platy, firm to moderately firm, sandy to very sandy, grading to sandstone, very calcareous, occasional shale light to dark gray to black, some green, sub blocky to sub platy to splintery, hard, silty in part, slightly calcareous, rare pyrite laminations and inclusions, occasional sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, firm, very calcareous, no stain, fluorescence, or cut
- 15340-15360 Abundant LCM Siltstone medium to dark gray to black, sub blocky to platy, firm to moderately firm, sandy to very sandy, grading to sandstone, very calcareous, occasional shale light to dark gray to black, some green, sub blocky to sub platy to splintery, hard, silty in part, slightly calcareous, abundant sandstone translucent to gray to white to salt and pepper, fine to very fine grained, sub angular to sub rounded, consolidated, poorly sorted, firm, very calcareous, rare pyrite, no stain, fluorescence, or cut
- 15360-15380 Abundant LCM Shale light to medium gray, occasional dark gray to black, platy to splintery to flaky to sub platy, soft to moderately firm, silty in part, non calcareous, trace disseminated pyrite, abundant siltstone medium to dark gray, sub blocky, moderately firm, sandy to very sandy, grading to sandstone in part, non calcareous, trace disseminated pyrite, occasional sandstone translucent to gray to white, occasional salt and pepper, fine to very fine grained sub rounded to sub angular, poorly consolidated, poorly sorted, moderately firm, slightly calcareous, trace disseminated pyrite, some dull orange mineral fluorescence, no stain or cut
- 15380-15400 Abundant LCM Sandstone white to translucent to gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, non calcareous, some siltstone medium to dark gray, sub blocky to sub platy, moderately firm to moderately soft, sandy in part, slightly calcareous, trace disseminated pyrite, occasional shale medium to dark gray, platy to sub platy, soft, silty in part, non calcareous, trace disseminated pyrite, trace dull orange mineral fluorescence, no stain or cut ✓
- 15400-15420 Abundant LCM Sandstone translucent to gray, occasional white, very fine to fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, non calcareous, some siltstone medium to dark gray, rare green, sub blocky to sub platy, moderately firm to moderately soft, sandy in part, very slightly to non calcareous, occasional shale medium to dark gray, platy to sub platy, soft, silty in part, non calcareous, no stain, fluorescence, or cut ✓

15420-15440 Abundant LCM Sandstone translucent to gray to white to light tan, fine to very fine grained, some loose coarse to medium grained quartz, sub rounded to sub angular, poorly consolidated to unconsolidated, calcareous to slightly calcareous, some siltstone medium to dark gray, sub blocky to platy, moderately firm to moderately soft, sandy to very sandy, grading to sandstone in part, slightly to non calcareous, rare disseminated pyrite, occasional shale medium to dark gray, some green to brown, platy to sub platy, soft, silty in part, non calcareous, no stain, fluorescence, or cut

15440-15460 Abundant LCM Sandstone translucent to gray to white, salt and pepper in part, fine to very fine grained, sub rounded to sub angular, poorly consolidated, soft, calcareous, abundant siltstone medium to dark gray, some green, sub blocky to platy, moderately firm to moderately soft, sandy to very sandy, grading to sandstone in part, slightly to non calcareous, occasional shale medium to dark gray, platy to sub platy, soft, silty in part, non calcareous, some mudstone, red brown, blocky, sandy in part, moderately firm, slightly calcareous, no stain, fluorescence, or cut

15460-15480 Abundant LCM Shale black, sub blocky to sub platy, soft to moderately soft, calcareous, occasional siltstone medium gray, sub blocky, moderately soft to moderately firm, calcareous, trace sandstone translucent to light gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated, poorly sorted, calcareous, no stain, fluorescence, or cut

15480-15500 Abundant LCM Siltstone medium to dark gray, sub blocky to sub platy, moderately soft to moderately firm, sandy in part, calcareous, abundant shale dark gray to black, sub blocky to sub platy, soft to moderately soft, silty in part, calcareous, occasional sandstone translucent to light gray, very fine to fine grained, sub rounded to sub angular, poorly consolidated to unconsolidated, poorly sorted, calcareous, no stain, fluorescence, or cut

STATE OF UTAH  
DIVISION OF OIL, GAS AND MINING5. Lease Designation and Serial No.  
UTU-084317

## SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.

Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name  
N/A7. Unit Agreement Name  
N/A8. Well Name and Number  
RYE PATCH FED 24-21

## 1. Type of Well

☐ Oil Well ☒ Gas Well ☐ Other

## 2. Name of Operator:

Petro-Canada Resources (USA) Inc.

## Contact:

Amy Karwan

## Phone:

(303) 965-7455

## 9. API Well Number

43-013-33443

## 3. Address and Telephone No.

999 18th St. Suite 600 Denver, CO 80202

(303) 297-2300

10. Field and Pool, or Exploratory Area  
undesignated

## 4. Location of Well

Footages: 606 FNL and 2144 FWL,

County: Duchesne

QQ, Sec T,R,M: NENW Section 24, T11S, R14E

State: Utah

## 11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

## NOTICE OF INTENT

(Submit in Duplicate)

- |  |   |
|--|---|
| <input type="checkbox"/> Abandon                   | <input type="checkbox"/> New Construction     |
| <input type="checkbox"/> Repair Casing             | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Change Plans              | <input type="checkbox"/> Recomplete           |
| <input type="checkbox"/> Convert to Injection      | <input type="checkbox"/> Reperforate          |
| <input type="checkbox"/> Fracture Treat or Acidize | <input type="checkbox"/> Vent or Flare        |
| <input type="checkbox"/> Multiple Completion       | <input type="checkbox"/> Water Shut-Off       |
| <input type="checkbox"/> Other                     |   |

## SUBSEQUENT REPORT

(Submit Original Form Only)

- |  |   |
|--|---|
| <input type="checkbox"/> Abandon*                  | <input type="checkbox"/> New Construction     |
| <input type="checkbox"/> Repair Casing             | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Change Plans              | <input type="checkbox"/> Recomplete           |
| <input type="checkbox"/> Convert to Injection      | <input type="checkbox"/> Reperforate          |
| <input type="checkbox"/> Fracture Treat or Acidize | <input type="checkbox"/> Vent or Flare        |
| <input type="checkbox"/> Water Shut-Off            |   |

☒ Other

Current Status

Date of work completion

Report results of Multiple Completions and Recompletions to different reservoirs  
on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.

\* Must be accompanied by a cement verification report.

Approximate date work will start

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection).

Petro-Canada spud the noted well at 2200 hrs on 08/18/2007.

Completion operations were commenced on 12/31/2007.

Please accept this as notification of date of first sales as 9/1/2008.

RECEIVED

NOV 10 2008

DIV. OF OIL, GAS &amp; MINING

13. Name (Printed/Typed) Amy Karwan

Title Engineering Tech

Signature

Date 10/29/2008

(This space for State use only)



Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Excalibur Well No. 15718, AFE No. 1714  
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TIGHT HOLE

- 07/07/08 Completion day 190. Well Shut In. SICP 2050 psi. SITP 2050 psi. Bled down pressure and prepared to swab. Recovered 10 bbls of fluid while bleeding down pressure. Pick up lubricator and prepare to swab. RIH and tag scattered fluid at 3800'. Made a total of 9 runs, pulling from S/N. Scattered fluid on each run. Recovered a total of 9 bbls while swabbing. Good gas flow following each swab and while bleeding down pressure. Well open to pit. Flowing dry gas on 18 choke. Flowing at a rate of approx. 200 MCF P/D. Steady flame with little or no water. Casing pressure at 320 psi. Tubing pressure at 50 psi. 41 bbls of water left to recover. Light traces of Co2.
- 07/08/08 **Completion Day 191.** Flaring well to pit on 18 choke. Casing pressure 280 psi, Tubing pressure 50 psi. Recovered 3 bbls of fluid during this period. Co2 0%. At 1000 hours opened up choke. Well continued to flow back straight gas with slugs of water occasionally. Recovered a total of 4 bbls during this period. Casing pressure 280 psi, Tubing pressure 20 psi. Co2 0%. Left to recover: 34 bbls of fluid.
- 07/09/08 **Completion Day 192.** Flaring well to pit on open choke. Solid flame with no fluids during this period. Casing pressure 280 psi, Tubing pressure 20 psi. Left to recover 34 bbls. Pull out of hole with tubing. ND BOP's and Annular. SDFN.
- 07/10/08 **Completion Day 193.** Check pressure at 0300 hours. SICP 1750 psi. Open well to pit. Well open to pit, casing pressure at 50 psi. Well flowing gas, flowed back approx. 1 bbl of condensate. Flaring well, Co2 0%. RU BWL, RIH with Composite bridge plug and set at 6315'. Pick up 100', run in and tag solid plug at 6315'. Pull out of hole with line and setting tool. Make up 4" casing guns and RIH. Perforated with 2 SPF from 6121' to 6128' and from 6055' to 6070'. 120 degree phasing, 23.5 gm, .43" diameter hole. Correlated to Baker Z-Density/Neutron log. Pulled out of hole, all shots fired and release same. Well Shut in. DC
- 07/11/08 **Completion Day 194.** Well shut in, moved in and rigged up Halliburton Frac equipment. Waiting on Plaxair.
- 07/12/08 **Completion Day 195.** Well shut in waiting on daylight and Praxair. Preparing to Frac Group T (20). Finished rigging up to Frac. Tested all lines to 9800 psi, ok. Held Safety Meeting. Opened well and loaded

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casing with 107 bbls of water. Pressure up and broke down formation 2415 psi with 10 bpm. Pumped in formation 100,700 lbs of 20/40 premium sand. Frac system 70% Co2 foam. Average pressure 4119 psi, average rate 38.2 bpm. Pumped a total of 620 bbls of fluid. Traced all sand with scandium. ISIP 3118 psi, Frac Gradient 0.94. 5 min 3041 psi, 10 min 2988 psi, 15 min 2967 psi. Max pressure while pumping 4598 psi. RU BWL, RIH and set Flow through Plug at 6000'. Make up and RIH with 4" casing gun and perforate 5906' to 5914', 4 SPF. Correlated to Baker density/neutron log. Pulled out of hole, all shots fired. Prepare to Frac group U (21) LAST ZONE. Pressure test to 9800 psi, ok. pressure on well at 2800 psi. Open Frac Valve and pump 12 bbls of fluid to load hole. Attempt to break down pressure, pressure went to 9024 psi. Pumps kicked out. Bleed pressure down to 4000 psi and pressured back up. Broke down at 8500 psi. 10 bpm. Pumped a total of 42500 lbs of 20/40 premium sand. Average rate 17.7 bpm, average pumping pressure 3739 psi. ISIP 3249, Frac Gradient 0.98, 5 min 3080 psi, 10 min 3040 psi, 15 min 3027 psi. Traced all sand with antimony. Opened well to pit on 18 choke. Casing pressure at 2900 psi. Flowed back a total of 104 bbls of fluid. Left to recover 818 bbls.

- 07/13/08     **Completion Day 196.** Flowing well to flow back tank on 18 choke. Co2 at 12%+, flowing back very little fluid. Casing pressure at 2300 psi. opened well up to a 24 choke. Pressure increased to 2360 psi, very little water. Co2 12%+, made a total of 163 bbls during this 24 hour period. Left to recover 655 bbls.
- 07/14/08     **Completion Day 197.** Well open to tank on 24 and 30 choke. 12% Co2. Slight traces of fluid. Opened well up to a 36 choke. Flaring gas to pit. Made a total of 41 bbls of fluid during this 24 hour period. Left to recover 614 bbls of fluid. Casing pressure at 30 psi. Will RIH and swab at daylight.
- 07/15/08     **Completion Day 198.** Well open to pit on 36 choke. Flaring gas with traces of water. Recovered 8 bbls during this period. Casing pressure at 30 psi. Co2 at 0600 2%. NU BOP's and annular. Rig up floor and RIH to swab. S/N 1 joint above notch collar. Pick up lubricator and prepare to swab. RIH and tagged scattered fluid at surface, solid fluid at 3100'. Pulled from 5000'. Made 4 swab runs with the last 2 pulling from S/N. Recovered a total of 39 bbls of fluid. Fluid is very gassy with traces of Co2. Strong gas blow after each swab run. After 4th run well kicked off

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and flowing to pit. Casing pressure at 250 psi and building. Lay hard line from tubing to pit. At 1900 hours shut well in for 12 hour pressure build up. Recovered a total of 47 bbls of fluid during this 24 hour period. Left to recover 567 bbls.

- 07/16/08      **Completion Day 199.** Well shut in for 12 hours to build pressure up. At 0700 after 12 hours pressure at 1240 psi on both casing and tubing. Opened well up on 18 choke. Well flaring to pit, made 1 to 2 bbls of condensate. Flowing back fluids in surges. Pressure at 360 psi at noon. Recovered a total of 12 bbls of fluid during this period. Casing pressure at 1320 psi, tubing pressure at 1190 psi. Continue to flow back and flare well. Opened on 24 choke at noon, when first opened up well made traces of condensate and surges of fluid. Made a total of 50 bbls of fluid during this 24 hour periods. Casing pressure at 360 psi, tubing pressure at 200 psi.
- 07/17/08      **Completion Day 200.** Flaring well on 24 choke. Flowing well back to flow back tank every 4 hours to check for flow back fluid. Recovered a total of 15 bbls of fluid during this period. Opened well to a 30 choke at 0700 hours. Well unloading surges of fluid with condensate. Flowed 3 to 4 bbls of condensate during this period. Casing pressure at 400 psi. Tubing pressure at 170 psi. Flowed back a total of 5 bbls of fluid during this period. Opened well to a 36 choke at 12 noon. Well flowed 2 bbls of condensate during this period. Flowed back 3 bbls of fluid during this period. Casing pressure at 375 psi, tubing at 150 psi. Flaring well on 24 and 30 choke. Casing pressure at 400 psi, tubing at 175 psi. Recovered a total of 16 bbls of fluid during this period. Recovered a total of 6 bbls of condensate. Recovered a total of 39 bbls of fluid during this 24 hour period. Left to recover 478 bbls.
- 07/18/08      **Completion Day 201.** Flared and flowed back well to flow back tank and pit. Casing pressure at 390 psi, tubing pressure at 210 psi. Recovered a total of 82 bbls of fluid during this period. Recovered a total 4 bbls of condensate during this period. Co2 ranging from 0 to 2%. 396 bbls of fluid left to recover. Well shut in for weekend pressure build up.
- 07/19/08      **Completion Day 202.** Well shut in.
- 07/20/08      **Completion Day 203.** Well shut in. Casing pressure at 1250 psi. Tubing pressure at 1225 psi.

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- 07/21/08      **Completion Day 204.** Continued to flow and flare well on an 18/24 and 30 choke. Pressure at 2400 hours, casing 250 psi and tubing at 200 psi. Co2% from 2% to 12%. Recovered a total of 93 bbls of fluid. Recovered a total of 1 bbl of condensate. 303 bbls left to recover.
- 07/22/08      **Completion Day 205.** Flaring well to pit on 24 choke. Recovered a total of 58 bbls of fluid. 0% Co2. Casing pressure at 260 psi, tubing pressure at 200 psi. No condensate during this period. 245 bbls left to recover.
- 07/23/08      **Completion Day 206.** Continued to flare and flow well on 24 and 30 choke. Casing pressure at 260 psi, tubing pressure 200 psi. Co2% 0. At 1100 hours received orders to prepare to squeeze 2 top zones. Opened well wide open to pit. Casing pressure at 100 psi, tubing pressure at 50 psi. Recovered a total of 138 bbls of fluid during this period. Recovered a total of 7 bbls of condensate during this period. Left to recover 110 bbls.
- 07/24/08      **Completion Day 207.** Well open on full opening choke. Casing pressure at 100 psi, tubing pressure at 50 psi. Left to recover 110 bbls. Rig up and pump 50 bbls in casing and 40 bbls in tubing to kill well. Ran in hole with 3 stands and 1 single to tag plug. Tagged solid plug at 6000'. No fill on perforations. Pulled out of hole with tubing. Laid down S/N and notch collar. Make up Halliburton Cement Retainer and start in hole. At 3070' retainer set. Halliburton operator unsure of the reason. Pull out of hole and check setting tool. Setting screws sheared. Lay down tools and prepare to drill up plug. SDFN.
- 07/25/08      **Completion Day 208.** SDFN. Pick up 3- 3 1/2" drill collars. Make up 4 1/2" roller type bit, bit sub, X-over and RIH. Tag cement retainer at 3071'. Pick up power swivel, break circulation. Drill cement retainer and circulate out. Pull out of hole, stand back 1 stand of 3 1/2" drill collars. Break out and lay down bit and bit sub. Crew travel. SDFN.
- 07/26/08      **Completion Day 209.** SDFN. Rig crews and Halliburton tool man arrived on location at 1000 hours to make up and RIH with Cement Retainer. The 10 AM start is due to Halliburton Cement Services could not be on location until 1500 to 1800 hours. Made up Cement Retainer and prepared to RIH. I phoned Halliburton to confirm they would be on location at 1500 hours and was informed they did not have a crew

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available until Monday. All of their crews were on jobs. Sent crew home and shut down until Monday AM.

- 07/27/08      **Completion Day 210.** Wait on Halliburton Cementing Services.
- 07/28/08      **Completion Day 211.** Wait on Halliburton and daylight. RIH with cement retainer to 5853'. No problems while running retainer. Prepare to squeeze perfs at 5906' to 5914', 8' & 3 SPF. Filled casing with 29 bbls of water. Set and tested retainer to 500 psi, ok. RU Halliburton. Held safety meeting. Tested all lines to 5000 psi, ok. Established injection rate of 2.5 BPM at 2750 psi. Squeezed perfs with 100 sacks of class G premium cement. With 0.3% Halad - 344, and 0.2% CFR-3 W/O de-foamer, 15.8 lbm/gal, 1.15 yield. Mixed and pumped cement with clean fresh water. Pressure increased to 4000 psi while squeezing. Let pressure bleed off to 3200 psi then brought back to 4000 psi. Pressure locked up at 4000 psi on third build up. 13 bbls in formation. Pulled out of retainer and left 1 bbl on top of retainer. Reversed out 8 bbls of good cement to pit. Pull out of hole and lay down setting tool. Wait on cement before drilling out.
- 07/29/08      **Completion Day 212.** Wait on cement and daylight. Make up 4 1/2" bit and 1 stand of 3 1/2" collars and start in hole. Hydraulic pump that runs tongs and etc. locked up and unable to repair. Excel ordered a new one that will arrive at 10:00 AM tomorrow. Shut down for rig repairs.
- 07/30/08      **Completion Day 213.** Wait on Rig Repairs. Replaced Hydraulic pump. After replacing the pump the problem is still the same. Unable to run tongs, etc. Waiting on mechanic. Rig crew continued to work on problem along with phone calls to their mechanic who was in Colorado working on another rig. After many checks it was discovered a filter in one of the hydraulic lines had worked itself around backwards. The problem was corrected. SDFN. No Charge for the rig the last 2 days.
- 07/31/08      **Completion Day 214.** Wait on daylight. Finish running in hole. Tag solid cement at 5835'. RU Power Swivel. Drill hard cement and cement retainer to 5944'. Circulated out cement. Cleaned out to 6000'. Pressure tested perforations to 1050 psi. Held for 15 minutes. Held solid. Drilled hard cement and FTP at 6015'. Drilled and cleaned out to 6286'. Circulated hole clean with clean fresh water. Strap out of hole with tubing and drill collars.

Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Excalibur Well No. 15718, AFE No. 1714  
Daily Reports  
TIGHT HOLE

- 08/01/08      **Completion Day 215.** Wait on daylight. Crews to arrive at 1000 hours along with tool hand. Crews worked until 10 PM last night. Cement services can not be on location until 1500 hours. Make up Halliburton cement retainer and RIH. Set retainer at 6011'. Halliburton cementers arrived on location at 1430 hours. Rigged up Halliburton. Held safety meeting, pressure tested all lines to 5000 psi, ok. Filled casing with 13 bbls of water and tested retainer to 500 psi. Established injection rate of 500 psi at 3 bpm. Mixed and pumped 150 sacks of premium class G cement 0.3% Halad-344, 0.2% CFR-3 W/O defoamer. Cement 15.8 lbm/gal, 1.15 yield. Mixed cement with clean fresh water. Began squeeze at 2 bpm at 500 psi. Pressure slowly increasing. With 10 bbls of cement in pipe reduced pumping rate to 1/2 bpm. Pressure increased to 3000 psi. Shut down for 5 minutes and pressure held. Pumped a total of **33.8 bbls of cement**. Pumped 25 bbls in perforations, 1 bbl from retainer to top perf and 1 bbl on top of retainer. Sting out of retainer. Lay down 3 joints of tubing and reverse out. RD Halliburton. Pull out of hole and lay down setting tool. SDFN, Wait on cement to set up.
- 08/02/08      **Completion Day 216.** Wait on Cement. Rig crews off for weekend. No charge for rig.
- 08/03/08      **Completion Day 217.** Wait on Cement Rig crews off for weekend. No charge for rig.
- 08/04/08      **Completion Day 218.** Wait on Cement. Make up new 4 1/2" tri-cone bit and run in hole. Tag cement at 5953'. Crew is 1 man short. Pick up and rig up power swivel. Broke circulation, drilled solid cement from 5953' to cement retainer at 6011'. Cement very hard. 3 hours to drill retainer at 6011'. Cleaned out to 6060'. Circulated hole clean with clean fresh water. Lots of cement returns. Laid down power swivel and pulled out with 20 stands of tubing. SDFN.
- 08/05/08      **Completion Day 219.** Wait on daylight. RIH with 20 stands of tubing. Break circulation. Drill hard cement from 6060' to 6230'. Circulated bottoms up and pressure tested perforations at 6055' to 6128'. Tested to 1000 psi and held solid for 15 minutes. Drilled cement to FTP at 6315'. Drilled plug and well started flowing. Opened well to pit on open choke. Pressure went to 600 psi on full open choke. Rigging up to pump water down casing and tubing. Pumped 45 bbls of fluid down tubing and 75 bbls down casing. Well flowing back on open choke with 600 psi. Ran in

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Excalibur Well No. 15718, AFE No. 1714  
Daily Reports  
TIGHT HOLE

hole to 8900', tagged sand on top of cement retainer. Circulated hole clean. Pulled out of hole to 4000', well flowing. Shut well in for night. SDFN.

- 08/06/08      **Completion Day 220.** Wait on daylight. SICP 200 psi. SITP 200 psi. Bleed down pressure, finish pulling out of hole with tubing and drill collars. Make up Halliburton cement retainer and RIH. Set retainer at 8315'. Rigged up TIW valve on top of tubing and left well open up tubing for the night. Halliburton Cementers could not be on location until tomorrow AM. Prepare to squeeze in the AM. Cleaned up location and location road. SDFN.
- 08/07/08      **Completion Day 221.** Wait on daylight. Sting out of retainer and fill both tubing and casing. Filled with 160 bbls of clean fresh water. Tubing had 20 psi at 0900 hours. Rig up Halliburton to squeeze perforations at 8382' to 8400'. Tested all lines to 7000 psi ok. Tested retainer to 500 psi ok. Sting into retainer and establish injection rate. 1 BPM at 2700 psi. Pull out of retainer and mix and spot **100 sacks of premium class G** with 0.3 Halad - 344, 0.2% CFR-3 W/O defoamer. Sting into retainer and pump cement. Pumped 5 bbls of cement in perforations. Pressure at 5000 psi 0.7 bpm. Total mixing and pumping time was 45 minutes. Bleed pressure down to 3100 psi. Pressured back to 5000 psi and pressure held. Bleed down pressure and sting out of retainer. LD 2 joints of tubing. Attempt to reverse out. Attempt to pump down tubing. Could not move fluid. Cement set up in tubing. According to Halliburton operator cement pumping time was 3 hours 15 minutes. For the 3rd time Halliburton arrived on location without a lab test on cement. Pulled wet string up to cemented tubing. 78 joints of tubing is cemented solid. Preparing to lay down same. Laid down 78 joints of cemented up tubing on pipe racks (2496'). Loaded out cemented up tubing from pipe racks to racks on side of location. Picked up good tubing from ground to replace cemented tubing. Measured the same. SDFN.
- 08/08/08      **Completion Day 222.** Wait on daylight. Make up new 4 1/2" bit. RIH with bit, 3 1/2" drill collars and 2 7/8" tubing. Tag solid cement at 8233'. Pick up and rig up power swivel. Break circulation. Drill hard cement from 8233' to top of retainer at 8313'. Drill retainer and clean out to 8589'. Test perforations from 8382' to 8400'. Pressured up to 1000 psi and held for 15 minutes, ok. Circulated hole clean. Pull up in casing 30 stands. SDFN.

Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
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Daily Reports  
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- 08/09/08 Completion Day 223. Wait on daylight. Unable to get to location due to washed out roads on Nine mile canyon and Gate Canyon. Heavy rains the last 2 days. Road into the location also in need of repairs. RIH, tagged cement stringers at 8589'. Cleaned out to top of cement retainer at 9054'. Circulated hole clean. Drilled cement retainer, retainer tough to get drilled up. Drilled firm cement to 9100'. Tested perforations to 1000 psi. Held for 15 minutes ok. Drilled hard cement to 9150'. Tested perforations to 1000 psi, held for 15 minutes ok. Drilled hard cement to 9200'. Tested perfs to 1000 psi and held for 15 minutes ok. Circulated hole clean. Circulated up lots of cement with some sand. Cleaned rig pit out and refilled with clean fresh water. Pull out with 15 stands of tubing and shut down. Hard rains all day with thunder and lightning. SDFN.
- 08/10/08 **Completion Day 224.** Operation shut down for Sunday.
- 08/11/08 **Completion Day 225.** Wait on daylight. RIH with tubing, tag cement at 9200'. Drill cement to 9400'. Test perfs to 1000 psi and held for 15 minutes. Ok. Drill hard cement to 10,200'. Circulated hole clean. Circulated out lots of cement and frac sand. Very hard drilling. Drill and circulate down to 10,360'. Hard drilling with lots of sand and cement recovery. Pull 15 stands up in casing. Cleaned out rig tank, full of sand and cement. Wait on daylight.
- 08/12/08 **Completion Day 226.** Wait on daylight. RIH. Tag at 10,360'. Drill hard cement to plug at 10,425'. Plug drilled hard. Drilled hard cement to 10,500', tested perforations to 1000 psi and held for 15 minutes. Ok. Drilled cement to 10,540' and tested perforations to 1000 psi, held for 15 minutes. Ok. Bit torques up, drilled to 10548'. Bit acting up, slacked off to 10,560' with no weight. Set swivel back and pulled 2 stands. Well began flowing up casing. Shut in for 30 minutes and pressure built up to 2300 psi. Opened well to pit on open choke. Flowing back well on open choke to pit. Pressure dropped to 500 psi and held 500 psi on tubing and casing. Attempted to flare well, gas burns until it is hit by a slug of water.
- 08/13/08 **Completion Day 227.** Well open to pit overnight. Well continued to flow gas and water. Gas burned until put out by water. Estimate water recovered at 130 bbls. Pressure at 0600 hours, casing 400 psi, tubing 475 psi. Kill well by pumping 65 bbls of water down casing, 45 bbls of water down tubing. Pulled out of hole with 14 stands of pipe and well began



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NENW Section 24, T11S, R14E, SLB&M  
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Daily Reports  
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flowing out tubing. Installed TIW value. While rigging up to pump water pressure increased on casing to 350 psi and 200 psi on tubing. Bled down and pumped 75 bbls down casing and 50 bbls down tubing. Pulled out with 13 stands and well flowing again up casing and tubing. Prepare to attempt to kill well. Pumped another 75 bbls down casing and 50 bbls down tubing. Well still flowing. Unable to POOH. Flowing well to pit on full 2" opening. Flowing gas with some water. Estimate 150 bbls of water during this period. Pressure on tubing 225 psi, casing 300 psi. Pumped a total of 460 bbls of water in well.

- 08/14/08      **Completion Day 228.** Continued to flow well to pit on full 2" opening. Making burnable gas with some water. Estimate water at 40 bbls during this period. Unloaded 400 bbls of 10.5 brine water. Rigged up and circulated hole with brine to kill well. Pumped a total of 280 bbls. Watched well for 30 minutes, remains dead. Pulled out of hole with tubing and drill collars. Bit looks ok. Make up Halliburton RTTS tool and start in hole. At 5002' well began to flow. Rigged up and pumped 40 bbls down tubing to kill well. Finished in hole with RTTS tool and set at 10,430'. Rigged up and pressured up on back side to 1000 psi, held ok. Rigged up and pumped down tubing. Pumped in 10 bbls at 1/2 BPM at 900 psi. Gas flow coming from below perfs below where we tested at 9400'. Rigged up lines to pit from casing and tubing. Left RTTS tool set at 10,430' with both tubing and casing open to pit.
- 08/15/08      **Completion Day 229.** Well open to pit on full 2" opening. Well unloaded brine water and flowed to pit. At 0700 well flaring to pit with 350 psi on tubing and casing. After discussions with management it was decided to shut well in for weekend and get well ready to put gas in sales line. Well shut in, will kill well on Monday and land tubing hanger in well head.
- 08/16/08      **Completion Day 230.** Well shut in. Waiting on tubing hanger, tree, and brine water.
- 08/17/08      **Completion Day 231.** Well shut in. SITP 5400 psi.
- 08/18/08      **Completion Day 232.** Well shut in. SITP 5400 psi SICP 1000 psi. Either RTTS tool leaking or perforations are open above tool. Trouble opening TIW value. Opened well to pit on 30 choke. Well flowed back gas with water. Unloaded 75 bbls of load water. Pressure dropped on

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tubing to 960 psi. After 3 hours pressure dropped to 550 psi and held. Bled down pressure on casing to 600 psi. After 1 hour pressure had increased to 620 psi. Will keep casing pressure bled down below 1000 psi. Flaring gas to pit with a strong blow. Shut well in for 1 hour while attempting to repair leaking valve on manifold. Pressure increased to 2700 psi in 1 hour. Continued to flare well to pit. Flowed a total of 25 bbls of water during this period. Flaring well on 24 choke with 300 psi tubing pressure. Casing pressure at 800 psi.

- 08/19/08      **Completion Day 233.** Well open on full choke. Recovered a total of 37 bbls of fluid. Bled down pressure on casing to 20 psi. Did not build back up. Pressure on tubing bled down to 20 psi on open choke. Flaring large amount of gas with little water. Gas and water samples sent in to Vernal.
- 08/20/08      **Completion Day 234.** Flowed well during night on open choke. Recovered a total of 37 bbls of fluid. Flaring very strong gas. Rig up to kill well with 10.5 brine. Pumped a total of 85 bbls down casing to fill same. Well flowing up tubing, TIW valve leaking rigged up lines on top of tubing to attempt to pull RTTS in neutral position in order to open by-pass valve. In 15 minutes tubing began flowing dry gas and pressure increasing to 800 psi. Opened by-pass and pumped 93 bbls in tubing before killing well. Immediately removed TIW and installed 2 7/8" tubing hanger with BPV installed in hanger. Spaced out and reset RTTS tool at 10,430'. Landed hanger in well head and well now secure. Rigged down floor, ND BOP's. Remove frac valve. Nipped up tree. Rigged up lubricator and pulled out BPV. Installed gauges on both tubing and casing to monitor each. Well shut in waiting on flow line hook-up. Released the following: drill collars, slips, elevators, lift subs, 2 TIW values, BOP's, accumulator, swivel, manifold, all lines and valves to manifold. Flow back tank, FBC.
- 08/21/08      **Completion Day 235.** Well shut in. Tubing pressure at 1000 psi, casing pressure 0 psi. Rig down rig.
- 08/22/08      **Completion Day 236.** Well shut in. Tubing pressure at 1100 psi, 0 casing pressure.
- 08/23/08      **Completion Day 237.** Well shut in. SITP: 1800 psi, SICP 0 psi.
- 08/24/08      **Completion Day 238.** Well shut in. SITP 2300 psi, SICP 0 psi.

Rye Patch Fed 24-21  
Operator: Petro-Canada Resources (USA) Inc.  
NENW Section 24, T11S, R14E, SLB&M  
Duchesne County, Utah  
API No. 43-013-33443  
Excalibur Well No. 15718, AFE No. 1714  
Daily Reports  
TIGHT HOLE

09/01/08	Flwd 669 mcf, 6/64 ck, 4100# TP. <b>TO to GASCO sales line 9/01/08.</b>
09/02/08	Flwd 348 mcf, 6/64 ck, 4100# TP. Turned well up.
09/03/08	Flwd 435 mcf, 6/64 ck, 4050# TP. Turned well up.
09/04/08	Flwd 693 mcf, 6/64 ck, 3000# TP.
09/05/08	Flwd 456 mcf, 6/64 ck, 3300# TP.
09/06/08	Flwd 456 mcf, 6/64 ck, 3900# TP. Well froze at well head, thawed out, turned back on.
09/07/08	Flwd 160 mcf, 6/64 ck, 4200# TP.
09/08/08	Flwd 326 mcf, 6/64 ck, 4200# TP.
09/09/08	Flwd 331 mcf, 6/64 ck, 4100# TP.
09/10/08	Flwd 148 mcf, 6/64 ck, 4200# TP. Traced well head, well head flowing again.
09/11/08	Flwd 24 mcf, 6/64 ck, 4250# TP. Froze at well head, wrapped insulation around.
09/12/08	Flwd 133 mcf, 6/64 ck, 4700# TP. At well head meth pump not working will replace.
09/13/08	Flwd 362 mcf, 6/64 ck, 4300# TP. Meth pump working.
09/14/08	Flwd 365 mcf, 6/64 ck, 4200# TP.
09/15/08	Flwd 549 mcf, 6/64 ck, 4000# TP.
09/16/08	Flwd 467 mcf, 6/64 ck, 3861# TP.

Division of Oil, Gas and Mining  
**OPERATOR CHANGE WORKSHEET**

**ROUTING**

- |        |
|--------|
| 1. DJJ |
| 2. CDW |

**X - Change of Operator (Well Sold)**

Operator Name Change/Merger

The operator of the well(s) listed below has changed, effective:

**1/1/2010**

**FROM: (Old Operator):**

N2705-Petro-Canada Resource (USA) Inc  
 999 18th St, Suite 600  
 Denver, CO 80202

Phone: 1 (303) 297-2300

**TO: ( New Operator):**

N2575-Gasco Production Co  
 8 Inverness Dr E, Suite 100  
 Englewood, CO 80112

Phone: 1 (303) 483-0044

**CA No.**

**Unit:**

WELL NAME	SEC	TWN	RNG	API NO	ENTITY NO	LEASE TYPE	WELL TYPE	WELL STATUS
AS ATTACHED								

**OPERATOR CHANGES DOCUMENTATION**

Enter date after each listed item is completed

- (R649-8-10) Sundry or legal documentation was received from the **FORMER** operator on: 3/9/2010
- (R649-8-10) Sundry or legal documentation was received from the **NEW** operator on: 3/9/2010
- The new company was checked on the **Department of Commerce, Division of Corporations Database** on: 3/9/2010
- a. Is the new operator registered in the State of Utah: Business Number: 1454161-0143
- a. (R649-9-2) Waste Management Plan has been received on: IN PLACE
- b. Inspections of LA PA state/fee well sites complete on: n/a
- c. Reports current for Production/Disposition & Sundries on: ok
- Federal and Indian Lease Wells:** The BLM and or the BIA has approved the merger, name change, or operator change for all wells listed on Federal or Indian leases on: BLM not yet BIA n/a
- Federal and Indian Units:**  
The BLM or BIA has approved the successor of unit operator for wells listed on: n/a
- Federal and Indian Communization Agreements ("CA"):**  
The BLM or BIA has approved the operator for all wells listed within a CA on: n/a
- Underground Injection Control ("UIC")** approved UIC Form 5, **Transfer of Authority to Inject**, for the enhanced/secondary recovery unit/project for the water disposal well(s) listed on: n/a

**DATA ENTRY:**

- Changes entered in the **Oil and Gas Database** on: 3/11/2010
- Changes have been entered on the **Monthly Operator Change Spread Sheet** on: 3/11/2010
- Bond information entered in RBDMS on: 3/11/2010
- Fee/State wells attached to bond in RBDMS on: n/a
- Injection Projects to new operator in RBDMS on: n/a
- Receipt of Acceptance of Drilling Procedures for APD/New on: 3/11/2010

**BOND VERIFICATION:**

- Federal well(s) covered by Bond Number: 4127759
- Indian well(s) covered by Bond Number: n/a
- a. (R649-3-1) The **NEW** operator of any state/fee well(s) listed covered by Bond Number n/a
- b. The **FORMER** operator has requested a release of liability from their bond on: n/a

**LEASE INTEREST OWNER NOTIFICATION:**

- (R649-2-10) The **NEW** operator of the fee wells has been contacted and informed by a letter from the Division of their responsibility to notify all interest owners of this change on: n/a

**COMMENTS:**

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-084317
2. NAME OF OPERATOR: PETRO-CANADA RESOURCES (USA), INC		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
3. ADDRESS OF OPERATOR: 999 18TH ST, SUITE 600 CITY DENVER STATE CO ZIP 80202		7. UNIT or CA AGREEMENT NAME: N/A
PHONE NUMBER: (303) 297-2300		8. WELL NAME and NUMBER: RYE PATCH FED 24-21
4. LOCATION OF WELL FOOTAGES AT SURFACE: 606' FNL 2244' FWL		9. API NUMBER: 4301333443
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 11S 14E S		10. FIELD AND POOL, OR WILDCAT: WILDCAT
COUNTY: DUCHESNE		STATE: UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input checked="" type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
<input checked="" type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: _____	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> OTHER: _____
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

As required, Petro-Canada Resources (USA) Inc., is notifying you of a change of operator for the above referenced well. Gasco Production Company federal bonding requirements as follows:  
Statewide Utah US/BLM #4127759 Gasco Energy, Inc. & Gasco Production Company  
Blanket Bond State of Utah Dept. Of Natural Res. 4127763 Gasco Production Company

Previous Operator: Petro-Canada Resource (USA) Inc  
Name: Dennis J. Gustafson

Title: Manager of Land

Signature: 

Date: February 25, 2010

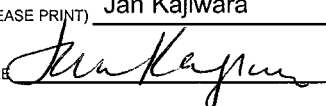
New Operator: Gasco Production Company  
Name: Michael K. Decker

Title: Executive Vice President and COO

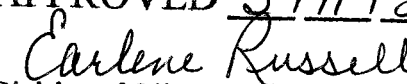
Signature: 

Date: February 25, 2010

EFFECTIVE DATE OF CHANGE OF OPERATOR: JANUARY 1, 2010

NAME (PLEASE PRINT) Jan Kajiwara	TITLE Regulatory Analyst
SIGNATURE 	DATE 2/25/2010

(This space for State use only)

APPROVED 3/11/2010  
  
(5/2000) Division of Oil, Gas and Mining  
Earlene Russell, Engineering Technician

(See Instructions on Reverse Side)

RECEIVED  
MAR 09 2010  
DIV. OF OIL, GAS & MINING



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT  
Green River District-Vernal Field Office  
170 South 500 East  
Vernal, UT 84078

(435) 781-4400 Fax: (435) 781-4410  
<http://www.blm.gov/ut/st/en/fo/vernal.html>



IN REPLY REFER TO:  
3162.3  
UTG011

May 20, 2010

Chuck Wilson  
Gasco Production Company  
8 Inverness Drive East, Suite 100  
Englewood, CO 80112

43-013-33443

Re: Change of Operator  
Well No. Rye Patch Federal 24-21  
NENW, Sec. 24, T11S, R14E  
Duchesne County, Utah  
Lease No. UTU-84317

Dear Mr. Wilson:

This correspondence is in regard to the self-certification statement submitted requesting a change of operator for the referenced well. After a review by this office, the change of operator request is approved. Effective February 25, 2010, Gasco Production Company is responsible for all operations performed on the referenced well. All liability will now fall under your bond, BLM Bond No. UT1233, for all operations conducted on the referenced well on the leased land.

If you have any other questions regarding this matter, please contact Cindy Severson of this office at (435) 781-4455.

Sincerely,

Ryan Angus  
Petroleum Engineer

Enclosure

cc: UDOGM  
Petro-Canada Resources (USA) Inc.

RECEIVED

JUN 10 2010

DIV. OF OIL, GAS & MINING

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB No. 1004-0137  
Expires: March 31, 2007

**SUNDRY NOTICES AND REPORTS ON WELLS**  
*Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.*

**SUBMIT IN TRIPLICATE - Other Instructions on reverse side.**

1. Type of Well <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other		5. Lease Serial No. UTU84317
2. Name of Operator Gasco Production Company		6. If Indian, Allottee, or Tribe Name NA
3a. Address 8 Inverness Drive East Ste 100 Englewood, Co 80112	3b. Phone No. (include area code) 303-483-0044	7. If Unit or CA. Agreement Name and/or No. NA
4. Location of Well (Footage, Sec., T., R., M., or Survey Description) 606' FNL & 2144' FWL NE NW of Section 24-T11S-R14E		8. Well Name and No. Rye Patch Federal 24-21
		9. API Well No. 4301333443
		10. Field and Pool, or Exploratory Area Wildcat
		11. County or Parish, State Duchesne

**12. CHECK APPROPRIATE BOX(S) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA**

TYPE OF SUBMISSION	TYPE OF ACTION			
<input checked="" type="checkbox"/> Notice of Intent	<input type="checkbox"/> Acidize	<input type="checkbox"/> Deepen	<input type="checkbox"/> Production (Start/Resume)	<input type="checkbox"/> Water Shut-off
<input type="checkbox"/> Subsequent Report	<input type="checkbox"/> Altering Casing	<input type="checkbox"/> Fracture Treat	<input type="checkbox"/> Reclamation	<input type="checkbox"/> Well Integrity
<input type="checkbox"/> Final Abandonment Notice	<input type="checkbox"/> Casing Repair	<input type="checkbox"/> New Construction	<input type="checkbox"/> Recomplete	<input checked="" type="checkbox"/> Other
	<input type="checkbox"/> Change Plans	<input type="checkbox"/> Plug and abandon	<input type="checkbox"/> Temporarily Abandon	Change of Operator
	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Plug back	<input type="checkbox"/> Water Disposal	

13. Describe Proposed or Completed Operations (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomple horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-5 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.

Effective February 25, 2010, Gasco Production Company has purchased the Rye Patch Federal 24-21.

Petro-Canada Resources (USA) Inc.  
999 18th Street, Suite 600  
Denver, CO 80202

*Dennis J. Gustafson*  
Dennis J. Gustafson Vice-President

Please be advised that Gasco Production Co. is considered to be the operator of the Rye Patch Federal 24-21, lease # UTU-84317, Duchesne County, and is responsible under the terms and conditions of the lease for the operations conducted upon the lease lands. Bond coverage is provided by State Wide BLM Bond UT1233 and the Blanket Drilling Bond # 4127763.

14. I hereby certify that the foregoing is true and correct.	
Name (Printed/ Typed) Chuck Wilson	Title Manager of Engineering & Operations
Signature <i>Chuck Wilson</i>	Date February 25, 2010

**THIS SPACE FOR FEDERAL OR STATE OFFICE USE**

Approved by <i>[Signature]</i>	Title Petroleum Engineer	Date MAY 20 2010
Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations.		
Title 18 U.S.C. Section 1001 AND Title 43 U.S.C. Section 1212, make it a crime knowingly and willfully to make any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.		

(Instructions on page 2)

JUN 10 2010

DIV. OF OIL, GAS & MINING

RECEIVED  
BUREAU OF LAND MANAGEMENT  
2010 FEB 25 PM 12 53  
VERNAL FIELD OFFICE

# RECEIVED

Form 3160-5  
(April 2004)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

MAR 17 2010

FORM APPROVED  
OMB No. 1004-0137  
Expires: March 31, 2007

**SUNDRY NOTICES AND REPORTS ON WELLS**  
**Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.**

**BLM**

**SUBMIT IN TRIPLICATE - Other Instructions on reverse side.**

1. Type of Well  
☐ Oil Well ☒ Gas Well ☐ Other

2. Name of Operator  
 Petro-Canada Resources (USA) Inc.

3a. Address  
 999 18th St., Suite 600 Denver, CO 80202

3b. Phone No. (include area code)  
 (303) 297-2100

4. Location of Well (Footage, Sec., T., R., M., or Survey Description)  
 606' FNL & 2144' FWL  
 NE NW of Section 24-T11S-R14E

5. Lease Serial No.  
 UTU84317

6. If Indian, Allottee, or Tribe Name  
 NA

7. If Unit or CA. Agreement Name and/or No.  
 NA

8. Well Name and No.  
 Rye Patch Federal 24-21

9. API Well No.  
 4301333443

10. Field and Pool, or Exploratory Area  
 Wildcat

11. County or Parish, State  
 Duchesne

**12. CHECK APPROPRIATE BOX(S) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA**

TYPE OF SUBMISSION	TYPE OF ACTION				
<input checked="" type="checkbox"/> Notice of Intent	<input type="checkbox"/> Acidize	<input type="checkbox"/> Deepen	<input type="checkbox"/> Production (Start/Resume)	<input type="checkbox"/> Water Shut-off	
<input type="checkbox"/> Subsequent Report	<input type="checkbox"/> Altering Casing	<input type="checkbox"/> Fracture Treat	<input type="checkbox"/> Reclamation	<input type="checkbox"/> Well Integrity	
<input type="checkbox"/> Final Abandonment Notice	<input type="checkbox"/> Casing Repair	<input type="checkbox"/> New Construction	<input type="checkbox"/> Recomplete	<input checked="" type="checkbox"/> Other	
	<input type="checkbox"/> Change Plans	<input type="checkbox"/> Plug and abandon	<input type="checkbox"/> Temporarily Abandon	Change of Operator	
	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Plug back	<input type="checkbox"/> Water Disposal		

13. Describe Proposed or Completed Operations (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleting horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleting in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.

Effective February 25, 2010, Petro-Canada Resources (USA) Inc. has sold the Rye Patch Federal 24-21 to:

Gasco production Company  
 8 Inverness Drive East, Suite 100  
 Englewood, CO 80112

*Chuck Wilson*  
 Chuck Wilson - Manager of Engineering & Operations

UT1233 - State Wide BLM Bond  
 4127763 - Blanket Drilling Bond

**VERNAL FIELD OFFICE**

ENG. \_\_\_\_\_

GEOL. \_\_\_\_\_

E.S. \_\_\_\_\_

PET. *no outstanding*

RECL. \_\_\_\_\_

14. I hereby certify that the foregoing is true and correct.  
 Name (Printed/ Typed)

Dennis J. Gustafson

Title

Vice President

Signature

Date

February 25, 2010

**THIS SPACE FOR FEDERAL OR STATE OFFICE USE**

Approved by

Petroleum Engineer

Date

MAY 20 2010

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

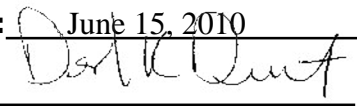
**VERNAL FIELD OFFICE**

Title 18 U.S.C. Section 1001 AND Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Instructions on page 2)

**UDOGM**



<b>STATE OF UTAH</b> DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		<b>FORM 9</b>			
<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>  Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		<b>5. LEASE DESIGNATION AND SERIAL NUMBER:</b> UTU-084317			
<b>1. TYPE OF WELL</b> Gas Well		<b>6. IF INDIAN, ALLOTTEE OR TRIBE NAME:</b>			
<b>2. NAME OF OPERATOR:</b> GASCO PRODUCTION COMPANY		<b>7. UNIT or CA AGREEMENT NAME:</b>			
<b>3. ADDRESS OF OPERATOR:</b> 8 Inverness Dr. East, Suite 100, Englewood, CO, 80112		<b>8. WELL NAME and NUMBER:</b> RYE PATCH FED 24-21			
<b>4. LOCATION OF WELL</b> <b>FOOTAGES AT SURFACE:</b> 0606 FNL 2144 FWL <b>QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:</b> Qtr/Qtr: NENW Section: 24 Township: 11.0S Range: 14.0E Meridian: S		<b>9. API NUMBER:</b> 43013334430000			
<b>PHONE NUMBER:</b> 303 483-0044 Ext		<b>9. FIELD and POOL or WILDCAT:</b> WILDCAT			
<b>COUNTY:</b> DUCHESNE		<b>STATE:</b> UTAH			
<b>11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA</b>					
<b>TYPE OF SUBMISSION</b>	<b>TYPE OF ACTION</b>				
<input checked="" type="checkbox"/> <b>NOTICE OF INTENT</b> Approximate date work will start: 5/17/2010  <input type="checkbox"/> <b>SUBSEQUENT REPORT</b> Date of Work Completion:  <input type="checkbox"/> <b>SPUD REPORT</b> Date of Spud:  <input type="checkbox"/> <b>DRILLING REPORT</b> Report Date:	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ACIDIZE  <input type="checkbox"/> CHANGE TO PREVIOUS PLANS  <input type="checkbox"/> CHANGE WELL STATUS  <input type="checkbox"/> DEEPEN  <input type="checkbox"/> OPERATOR CHANGE  <input type="checkbox"/> PRODUCTION START OR RESUME  <input checked="" type="checkbox"/> REPERFORATE CURRENT FORMATION  <input type="checkbox"/> TUBING REPAIR  <input type="checkbox"/> WATER SHUTOFF  <input type="checkbox"/> WILDCAT WELL DETERMINATION         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ALTER CASING  <input type="checkbox"/> CHANGE TUBING  <input checked="" type="checkbox"/> COMMINGLE PRODUCING FORMATIONS  <input checked="" type="checkbox"/> FRACTURE TREAT  <input type="checkbox"/> PLUG AND ABANDON  <input type="checkbox"/> RECLAMATION OF WELL SITE  <input type="checkbox"/> SIDETRACK TO REPAIR WELL  <input type="checkbox"/> VENT OR FLARE  <input type="checkbox"/> SI TA STATUS EXTENSION  <input type="checkbox"/> OTHER         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> CASING REPAIR  <input type="checkbox"/> CHANGE WELL NAME  <input type="checkbox"/> CONVERT WELL TYPE  <input type="checkbox"/> NEW CONSTRUCTION  <input type="checkbox"/> PLUG BACK  <input checked="" type="checkbox"/> RECOMPLETE DIFFERENT FORMATION  <input type="checkbox"/> TEMPORARY ABANDON  <input type="checkbox"/> WATER DISPOSAL  <input type="checkbox"/> APD EXTENSION            OTHER:         </td> </tr> </table>		<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input checked="" type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input checked="" type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input checked="" type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input checked="" type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER:
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<b>12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.</b>					
<p>Gasco acquired this wellbore from PetroCanada and it is currently producing from the Mancos and Mesaverde formations. Gasco intends to fish scaled tubing out of this wellbore. Then Gasco will reperforate and fracture treat the Wasatch perforations that were squeezed off. Gasco will perforate the sands from 5,900'-6,200' and fracture treat with roughly 90,000 lbs of white sand. Frac plugs will then be drilled out to PBTD and tubing will be landed at roughly 8,500' with a 1/4" SS2205 capillary string run through the tubing to the bottom set of perforations in order to inject scale and corrosion inhibitor. A subsequent report will be filed detailing the exact work that takes place. Gasco has sent notices to XTO and EOG of the commingling in this wellbore. Gasco does not feel allocation is necessary, but if so, will be done by individual hydrocarbon pore volume calculations.</p>					
<div style="text-align: right;"> <b>Accepted by the</b>  <b>Utah Division of</b>  <b>Oil, Gas and Mining</b>   <b>Date:</b> June 15, 2010  <b>By:</b>  </div>					
<b>NAME (PLEASE PRINT)</b> Matt Owens	<b>PHONE NUMBER</b> 303 996-1839	<b>TITLE</b> Petroleum Engineer			
<b>SIGNATURE</b> N/A	<b>DATE</b> 5/17/2010				

<b>STATE OF UTAH</b> DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		<b>FORM 9</b>			
<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>  Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		<b>5. LEASE DESIGNATION AND SERIAL NUMBER:</b> UTU-084317			
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<b>2. NAME OF OPERATOR:</b> GASCO PRODUCTION COMPANY		<b>7. UNIT or CA AGREEMENT NAME:</b>			
<b>3. ADDRESS OF OPERATOR:</b> 8 Inverness Dr. East, Suite 100 , Englewood, CO, 80112		<b>8. WELL NAME and NUMBER:</b> RYE PATCH FED 24-21			
<b>4. LOCATION OF WELL</b> <b>FOOTAGES AT SURFACE:</b> 0606 FNL 2144 FWL <b>QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:</b> Qtr/Qtr: NENW Section: 24 Township: 11.0S Range: 14.0E Meridian: S		<b>9. API NUMBER:</b> 43013334430000			
<b>PHONE NUMBER:</b> 303 483-0044 Ext		<b>9. FIELD and POOL or WILDCAT:</b> GATE CANYON			
<b>COUNTY:</b> DUCHESNE		<b>STATE:</b> UTAH			
<b>11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA</b>					
<b>TYPE OF SUBMISSION</b>  <input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:  <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 7/1/2010  <input type="checkbox"/> SPUD REPORT Date of Spud:  <input type="checkbox"/> DRILLING REPORT Report Date:	<b>TYPE OF ACTION</b>  <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ACIDIZE   <input type="checkbox"/> CHANGE TO PREVIOUS PLANS   <input type="checkbox"/> CHANGE WELL STATUS   <input type="checkbox"/> DEEPEN   <input type="checkbox"/> OPERATOR CHANGE   <input type="checkbox"/> PRODUCTION START OR RESUME   <input checked="" type="checkbox"/> REPERFORATE CURRENT FORMATION   <input type="checkbox"/> TUBING REPAIR   <input type="checkbox"/> WATER SHUTOFF   <input type="checkbox"/> WILDCAT WELL DETERMINATION         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ALTER CASING   <input type="checkbox"/> CHANGE TUBING   <input checked="" type="checkbox"/> COMMINGLE PRODUCING FORMATIONS   <input checked="" type="checkbox"/> FRACTURE TREAT   <input type="checkbox"/> PLUG AND ABANDON   <input type="checkbox"/> RECLAMATION OF WELL SITE   <input type="checkbox"/> SIDETRACK TO REPAIR WELL   <input type="checkbox"/> VENT OR FLARE   <input type="checkbox"/> SI TA STATUS EXTENSION   <input type="checkbox"/> OTHER         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> CASING REPAIR   <input type="checkbox"/> CHANGE WELL NAME   <input type="checkbox"/> CONVERT WELL TYPE   <input type="checkbox"/> NEW CONSTRUCTION   <input type="checkbox"/> PLUG BACK   <input checked="" type="checkbox"/> RECOMPLETE DIFFERENT FORMATION   <input type="checkbox"/> TEMPORARY ABANDON   <input type="checkbox"/> WATER DISPOSAL   <input type="checkbox"/> APD EXTENSION           OTHER: <input style="width: 100px;" type="text"/> </td> </tr> </table>		<input type="checkbox"/> ACIDIZE  <input type="checkbox"/> CHANGE TO PREVIOUS PLANS  <input type="checkbox"/> CHANGE WELL STATUS  <input type="checkbox"/> DEEPEN  <input type="checkbox"/> OPERATOR CHANGE  <input type="checkbox"/> PRODUCTION START OR RESUME  <input checked="" type="checkbox"/> REPERFORATE CURRENT FORMATION  <input type="checkbox"/> TUBING REPAIR  <input type="checkbox"/> WATER SHUTOFF  <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING  <input type="checkbox"/> CHANGE TUBING  <input checked="" type="checkbox"/> COMMINGLE PRODUCING FORMATIONS  <input checked="" type="checkbox"/> FRACTURE TREAT  <input type="checkbox"/> PLUG AND ABANDON  <input type="checkbox"/> RECLAMATION OF WELL SITE  <input type="checkbox"/> SIDETRACK TO REPAIR WELL  <input type="checkbox"/> VENT OR FLARE  <input type="checkbox"/> SI TA STATUS EXTENSION  <input type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR  <input type="checkbox"/> CHANGE WELL NAME  <input type="checkbox"/> CONVERT WELL TYPE  <input type="checkbox"/> NEW CONSTRUCTION  <input type="checkbox"/> PLUG BACK  <input checked="" type="checkbox"/> RECOMPLETE DIFFERENT FORMATION  <input type="checkbox"/> TEMPORARY ABANDON  <input type="checkbox"/> WATER DISPOSAL  <input type="checkbox"/> APD EXTENSION  OTHER: <input style="width: 100px;" type="text"/>
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<b>12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.</b> Gasco Culminated recompletion activities on stages 19-21 for this well on 7/1/2010. All remaining production zones in the Wasatch formation were completed. Please see attached wellbore diagram for the sand and fluid volumes for which stages 19-21 were completed.					
<b>Accepted by the</b> <b>Utah Division of</b> <b>Oil, Gas and Mining</b> <b>FOR RECORD ONLY</b> August 16, 2010					
<b>NAME (PLEASE PRINT)</b> Roger Knight		<b>PHONE NUMBER</b> 303 996-1803			
<b>SIGNATURE</b> N/A		<b>TITLE</b> EHS Supervisor			
<b>DATE</b> 8/10/2010					

LEASE:

FIELD:

LOCATION:

COUNTY:

Duchsene

ST: Utah

API:

WELL #:

Rye Patch

Rye Patch Federal 24-21

CONDUCTOR

SIZE:

WT/GRD:

WT/GRD:

CSA:

SX:

CIRC:

TOC:

HOLE SIZE:

SIZE:

WT/GRD:

WT/GRD:

CSA:

SX:

CIRC:

TOC:

HOLE SIZE:

SIZE:

WT/GRD:

WT/GRD:

CSA:

SX:

CIRC:

TOC:

HOLE SIZE:

GL: 6969

KB: 27

SPUD DATE:

COMP DATE:

DATE FIRST PRODUCED

PRODUCTION METHOD

CHOKE SIZE

Csg PRESSURE

OIL (BBL)

GAS (MCF)

WATER (BBL)

Length

7,000'

Production String

216 Joints - 2-3/8", 4.7#, P-110 EUE 8RD

Stimulation

Stage 21:

6/25/2010

2,083 bbls FR slick water w/ 2,320# 100 mesh, 73,780# 30/50 white, 19,320# 30/50 resin. ISIP 3364 psi (Reperf and frac Wasatch)

Stage 20:

7/12/2008

CO2 frac. Brk dn @ 8500#. 302 BW w/ 42500# 20/40 white. ISIP 3027#. Trace Sb. **Cmt sqz'd**

Stage 19:

7/12/2008

CO2 frac. Brk dn @ 2415#. 620 BW w/ 100700# 20/40 white. ISIP 3118#. Trace Sc. **Cmt sqz'd**

Stage 18:

6/30/2008

CO2 frac. Brk dn @ 4286#. 496 BW w/ 70018# 20/40 white, 113T CO2. ISIP 9456#. Trace Ir. **Cmt sqz'd**

Stage 17:

6/15/2008

CO2 frac. Brk dn @ 4655#. 496 BW w/ 68700# 20/40 white, 113T CO2. ISIP 3237#. Trace Sb. **Cmt sqz'd**

Stage 16:

6/14/2008

CO2 frac. Brk dn @ 4396#. 750 BW w/ 126600# 20/40 white. ISIP 3237#. Trace Sc. **Cmt sqz'd**

Stage 15:

5/12/2008

CO2 frac. Brk dn @ 5014#. 835 BW w/ 121100# 20/40 PRC. 170T CO2. ISIP 3805#. Trace Ir. **Cmt sqz'd failed**

Stage 14:

5/7/2008

CO2 frac. Brk dn @ 5382#. 780 BW w/ 150200# 20/40 PRC. 244T CO2. ISIP 4747#. Trace Sb

Stage 13:

5/6/2008

CO2 frac. Brk dn @ 6602#. 950 BW w/ 89000 20/40 PRC. 240T CO2. ISIP 4697#. Trace Sc

Stage 12:

2/20/2008

Slick wtr frac. Brk dn @ 7049#. 3788 BW w/ 60300# 30/50 PRC. ISIP 4980#. Trace Ir

Stage 11:

2/19/2008

Slick wtr frac. Brk dn @ 7560#. 3363 BW w/ 50000# 30/50 PRC. ISIP 5100#. Trace Sb

Stage 10:

2/4/2008

Slick wtr frac. Brk dn @ 8603#. 2673 BW w/ 23539# 30/50 PRC. ISIP 6053. Trace Ir

Stage 9:

2/3/2008

Slick wtr frac. Brk dn @ 7859#. 3810 BW w/ 59383# 30/50 PRC. ISIP 6449#. Trace Sc

Stage 8:

2/2/2008

Slick wtr frac. Brk dn @ 8408#. 3960 BW w/ 6010# 30/50 PRC. ISIP 7758# Trace Sb

Stage 7:

1/31/2008

Slick wtr frac. Brk dn @ 10348#. 2803 BW w/ 32096# 30/50 ceramic. ISIP 7520. Trace Sc. Shut down after .75# because blender

Stage 6:

1/30/2008

Slick wtr frac. Brk dn @ 9862#. 1278 BW w/ 4000# 30/50 Ceramic. ISIP 8944#. Trace Ir. Screened out in .25# stage

Stage 5:

1/23/2008

Slick wtr frac. Brk dn @ 9530# 1787 BW w/ 15130# 30/50 Ceramic. ISIP 7420#. Trace Sb

Stage 4:

1/23/2008

Slick wtr frac. Brk dn @ 12095#. 2445 BW 28700# 30/50 Ceramic. ISIP 7900#. Trace Sc

Stage 3:

1/14/2008

Slick wtr frac. Brk dn @ 10800#. 3440 BW w/ 56,500# 30/50 ceramic. ISIP 8027#. Trace Ir

Stage 2:

1/12/2008

Slick wtr frac w/ brk @ 11,600#. 1884 BW w/ 13,400# 30/60 baux, scrm out .5# sand. ISIP 10370#. Trace Sb

Stage 1:

12/28/2007

CO2 Frac'd. Brk dn 9500#. 55,000# bauxite, 115T CO2, 683 BW, ISIP 8297#. Test 1.5 MM. Trace Ir.

MD 15,516

TD 15,516

Re-perfs

5906-14

6055-70

6121-28

5908-10

6056-60

6122-28

Stage 20 - Wasatch

Stage 19 - Wasatch

Stage 19 - Wasatch

8382-400

Stage 18 - Price River

9076-86

9132-36

9186-90

9360-64

Stage 17 - Blue Castle

Stage 17 - Blue Castle

Stage 16 - Blue Castle

Stage 16 - Blue Castle

10471-78

10522-28

10682-98

10777-81

10932-43

11074-82

11172-80

11466-72

11499-506

11781-86

11847-52

12120-26

12330-36

12667-72

12860-64

13082-87

13335-40

13730-38

13792-800

14108-13

14156-68

14315-20

14565-76

14720-25

14913-18

14994-98

15250-55

15370-75

10574-86

10738-48

10827-34

11228-36

11480-86

11587-92

11967-72

12375-80

12808-20

12939-43

13305-10

13510-15

13898-906

14203-08

14382-87

14489-502

14788-803

15050-58

15325-30

Stage 15 - Sunnyside

Stage 15 - Sunnyside

Stage 14 - Kenilworth

Stage 14 - Kenilworth

Stage 13 - Aberdeen

Stage 12 - Mancos

Stage 12 - Mancos

Stage 11 - Mancos

Stage 11 - Mancos

Stage 10 - Mancos

Stage 10 - Mancos

Stage 9 - Mancos

Stage 9 - Mancos

Stage 8 - Mancos

Stage 8 - Mancos

Stage 7 - Mancos

Stage 7 - Mancos

Stage 6 - Mancos

Stage 6 - Mancos

Stage 5 - Mancos

Stage 5 - Mancos

Stage 5 - Mancos

Stage 4 - Mancos

Stage 3 - Mancos

Stage 3 - Mancos

Stage 2 - Mancos

Stage 2 - Mancos

Stage 1 - Dakota

Prepared/Revised by:

MRO

CHW

Date

3/15/2010

7/19/2010

PBTD @ 14,917' (6/30/2010)

**STATE OF UTAH**  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

FORM 6

**ENTITY ACTION FORM**

Operator: Gasco Production Co Operator Account Number: N 2575  
Address: 8 Inverness Drive East, Ste 100  
city Englewood  
state Co zip 80112 Phone Number: (303) 483-0044

**Well 1**

API Number	Well Name		QQ	Sec	Twp	Rng	County
4301333443	Rye Patch Federal 24-21		NENW	24	11S	14E	Duchesne
Action Code	Current Entity Number	New Entity Number	Spud Date		Entity Assignment Effective Date		
E	16367	16367	8/18/2007		7/1/2010		
<b>Comments:</b> Formation Change from MNCS to WSMVM <span style="float: right;">8/24/10</span>							

**Well 2**

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date		Entity Assignment Effective Date		
<b>Comments:</b>							

**Well 3**

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date		Entity Assignment Effective Date		
<b>Comments:</b>							

**ACTION CODES:**

- A - Establish new entity for new well (single well only)
- B - Add new well to existing entity (group or unit well)
- C - Re-assign well from one existing entity to another existing entity
- D - Re-assign well from one existing entity to a new entity
- E - Other (Explain in 'comments' section)

Jessica Berg

Name (Please Print)

Signature

Production Tech

Title

8/26/2010

Date

**RECEIVED**

AUG 26 2010

(5/2000)

DIV. OF OIL, GAS & MINING

<b>STATE OF UTAH</b> DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		<b>FORM 9</b>
<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>  Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		<b>5. LEASE DESIGNATION AND SERIAL NUMBER:</b> UTU-084317
<b>1. TYPE OF WELL</b> Gas Well		<b>6. IF INDIAN, ALLOTTEE OR TRIBE NAME:</b>
<b>2. NAME OF OPERATOR:</b> GASCO PRODUCTION COMPANY		<b>7. UNIT or CA AGREEMENT NAME:</b>
<b>3. ADDRESS OF OPERATOR:</b> 8 Inverness Dr. East, Suite 100 , Englewood, CO, 80112		<b>8. WELL NAME and NUMBER:</b> RYE PATCH FED 24-21
<b>4. LOCATION OF WELL</b> <b>FOOTAGES AT SURFACE:</b> 0606 FNL 2144 FWL <b>QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:</b> Qtr/Qtr: NENW Section: 24 Township: 11.0S Range: 14.0E Meridian: S		<b>9. API NUMBER:</b> 43013334430000
<b>PHONE NUMBER:</b> 303 483-0044 Ext		<b>9. FIELD and POOL or WILDCAT:</b> GATE CANYON
<b>COUNTY:</b> DUCHESNE		<b>STATE:</b> UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> <b>NOTICE OF INTENT</b> Approximate date work will start: 10/12/2010  <input type="checkbox"/> <b>SUBSEQUENT REPORT</b> Date of Work Completion:  <input type="checkbox"/> <b>SPUD REPORT</b> Date of Spud:  <input type="checkbox"/> <b>DRILLING REPORT</b> Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input checked="" type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input style="width: 100px;" type="text"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.  
  

Gasco would like to dispose of water at RN Industries state approved commercial disposal facility located in Sections 4 and 9 Township 2 south Range 2 west in Bluebell UT. This facility would be used in addition to the currently approved disposal facilities that Gasco uses to dispose of water from this well.

Approved by the  
Utah Division of  
Oil, Gas and Mining

Date: October 06, 2010

By:

<b>NAME (PLEASE PRINT)</b> Roger Knight	<b>PHONE NUMBER</b> 303 996-1803	<b>TITLE</b> EHS Supervisor
<b>SIGNATURE</b> N/A		<b>DATE</b> 10/5/2010

<b>STATE OF UTAH</b> DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		<b>FORM 9</b>
<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>  Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		<b>5. LEASE DESIGNATION AND SERIAL NUMBER:</b> UTU-084317
<b>1. TYPE OF WELL</b> Gas Well		<b>6. IF INDIAN, ALLOTTEE OR TRIBE NAME:</b>
<b>2. NAME OF OPERATOR:</b> GASCO PRODUCTION COMPANY		<b>7. UNIT or CA AGREEMENT NAME:</b>
<b>3. ADDRESS OF OPERATOR:</b> 8 Inverness Dr. East, Suite 100 , Englewood, CO, 80112		<b>8. WELL NAME and NUMBER:</b> RYE PATCH FED 24-21
<b>4. LOCATION OF WELL</b> <b>FOOTAGES AT SURFACE:</b> 0606 FNL 2144 FWL <b>QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:</b> Qtr/Qtr: NENW Section: 24 Township: 11.0S Range: 14.0E Meridian: S		<b>9. API NUMBER:</b> 43013334430000
<b>PHONE NUMBER:</b> 303 483-0044 Ext		<b>9. FIELD and POOL or WILDCAT:</b> GATE CANYON
<b>COUNTY:</b> DUCHESNE		<b>STATE:</b> UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> <b>NOTICE OF INTENT</b> Approximate date work will start: 1/1/2011  <input type="checkbox"/> <b>SUBSEQUENT REPORT</b> Date of Work Completion:  <input type="checkbox"/> <b>SPUD REPORT</b> Date of Spud:  <input type="checkbox"/> <b>DRILLING REPORT</b> Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input checked="" type="checkbox"/> <b>WATER DISPOSAL</b> <input type="checkbox"/> APD EXTENSION OTHER: <input style="width: 100px;" type="text"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.  
 Gasco would like to dispose of water at Integrated Water management, LLC state approved commercial disposal facility located in Section 30, 2 south Range 4 west in North Blue Bench UT. This facility would be used in addition to the currently approved disposal facilities that Gasco uses to dispose of water from this well.

**Accepted by the**  
**Utah Division of**  
**Oil, Gas and Mining**  
**FOR RECORD ONLY**  
 01/12/2011

<b>NAME (PLEASE PRINT)</b> Jessica Berg	<b>PHONE NUMBER</b> 303 996-1805	<b>TITLE</b> Production Clerk
<b>SIGNATURE</b> N/A	<b>DATE</b> 12/31/2010	



<b>STATE OF UTAH</b> DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		<b>FORM 9</b>			
<b>SUNDRY NOTICES AND REPORTS ON WELLS</b>  Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		<b>5. LEASE DESIGNATION AND SERIAL NUMBER:</b> UTU-084317			
<b>1. TYPE OF WELL</b> Gas Well		<b>6. IF INDIAN, ALLOTTEE OR TRIBE NAME:</b>			
<b>2. NAME OF OPERATOR:</b>		<b>7. UNIT or CA AGREEMENT NAME:</b>			
<b>3. ADDRESS OF OPERATOR:</b> , , , Ext		<b>8. WELL NAME and NUMBER:</b> RYE PATCH FED 24-21			
<b>4. LOCATION OF WELL</b> <b>FOOTAGES AT SURFACE:</b> 0606 FNL 2144 FWL <b>QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:</b> Qtr/Qtr: NENW Section: 24 Township: 11.0S Range: 14.0E Meridian: S		<b>9. API NUMBER:</b> 43013334430000			
<b>9. FIELD and POOL or WILDCAT:</b> GATE CANYON		<b>COUNTY:</b> DUCHESNE			
<b>STATE:</b> UTAH					
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA					
<b>TYPE OF SUBMISSION</b>	<b>TYPE OF ACTION</b>				
<input checked="" type="checkbox"/> <b>NOTICE OF INTENT</b> Approximate date work will start: <b>8/24/2012</b>  <input type="checkbox"/> <b>SUBSEQUENT REPORT</b> Date of Work Completion:  <input type="checkbox"/> <b>SPUD REPORT</b> Date of Spud:  <input type="checkbox"/> <b>DRILLING REPORT</b> Report Date:	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ACIDIZE  <input type="checkbox"/> CHANGE TO PREVIOUS PLANS  <input type="checkbox"/> CHANGE WELL STATUS  <input type="checkbox"/> DEEPEN  <input type="checkbox"/> OPERATOR CHANGE  <input type="checkbox"/> PRODUCTION START OR RESUME  <input type="checkbox"/> REPERFORATE CURRENT FORMATION  <input type="checkbox"/> TUBING REPAIR  <input type="checkbox"/> WATER SHUTOFF  <input type="checkbox"/> WILDCAT WELL DETERMINATION         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> ALTER CASING  <input type="checkbox"/> CHANGE TUBING  <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS  <input type="checkbox"/> FRACTURE TREAT  <input type="checkbox"/> PLUG AND ABANDON  <input type="checkbox"/> RECLAMATION OF WELL SITE  <input type="checkbox"/> SIDETRACK TO REPAIR WELL  <input type="checkbox"/> VENT OR FLARE  <input type="checkbox"/> SI TA STATUS EXTENSION  <input checked="" type="checkbox"/> OTHER         </td> <td style="width: 33%; vertical-align: top;"> <input type="checkbox"/> CASING REPAIR  <input type="checkbox"/> CHANGE WELL NAME  <input type="checkbox"/> CONVERT WELL TYPE  <input type="checkbox"/> NEW CONSTRUCTION  <input type="checkbox"/> PLUG BACK  <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION  <input type="checkbox"/> TEMPORARY ABANDON  <input checked="" type="checkbox"/> WATER DISPOSAL  <input type="checkbox"/> APD EXTENSION          OTHER: <input style="width: 100px;" type="text" value="pilot test"/> </td> </tr> </table>		<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input checked="" type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input style="width: 100px;" type="text" value="pilot test"/>
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12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.  Gasco Production Company will test a produced water evaporation system on the Rye Patch Fed 24-21 for a 30 day period. Attached is information on the technology to be used.					
<b>NAME (PLEASE PRINT)</b> Roger Knight		<b>PHONE NUMBER</b> 303 996-1803			
<b>SIGNATURE</b> N/A		<b>TITLE</b> EHS Supervisor			
<b>DATE</b> 8/14/2012					

**Accepted by the**  
**Utah Division of**  
**Oil, Gas and Mining**  
**FOR RECORD ONLY**  
 August 28, 2012



## Flash Concentrator -Emissions

### Equipment Overview

The Flash Concentrator is stand-alone piece of equipment that is used to concentrate produced, flow-back, leachate and other high Total Dissolved Solids (TDS) waters up to saturation. Allowing companies to minimize trucking and disposal costs associated with high TDS waste waters.

### Emissions

#### Air

- Natural Gas Burner (See attached Maxon Burner)
- Power Generator Exhaust System
  - Natural Gas ( Attached Honda Generator Manual)
  - Diesel (See attached Cummins generator information)

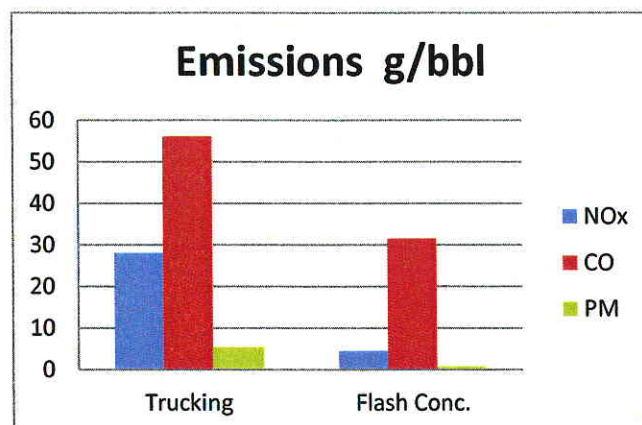
#### Water

There are no water discharge points on the unit. It takes in lower TDS water and concentrates it up to saturation. The concentrated brine is returned to the process and the distilled water is emitted in the form of water vapor. (See Attached Amistco sizing information)

Water vapor is stripped of toxic substances during evaporation. Any low density water droplets that may be airborne during the process, are stripped out by use of mist eliminator technology.

#### NOx, CO & PM

The following graph shows the calculated reduction in greenhouse gases by comparison to diesel truck hauling water for two hours over a sealed road. PM discharge on an unsealed road will be much higher.





## Specifications of TUBE-O-THERM® burners

### 3" & 4" TUBE-O-THERM® burners

Typical burner data					
Fuel: natural gas at 60°F with 1000 Btu/ft <sup>3</sup> (st) HHV - sg = 0.6 [1]					
Combustion air: 60°F - 21% O <sub>2</sub> - 50% humidity - sg = 1.0 [1]					
Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.					
TUBE-O-THERM® burner	Size	3" burner		4" burner	
	Description	Pkgd.	EB	Pkgd.	EB
Maximum capacity [2]	MBtu/h	0.5	0.75	0.9	1.35
Pilot capacity	MBtu/h	0.05	0.075	0.09	0.135
Minimum capacity	MBtu/h	0.05	0.075	0.09	0.135
Natural gas pressure at burner inlet	"wc	35.3	72.5	29.5	65.3
Natural gas pressure at burner test port	"wc	32.1	63.0	25.8	56.9
Natural gas pilot gas pressure at burner test port	"wc	0.6	1.2	0.5	1.0
Combustion air pressure at burner inlet	"wc	5.6	16.8	6.6	15.4
Combustion air pressure at burner test port	"wc	4.3	9.5	4.4	10.4
Differential air pressure [3]	"wc	1.5	2.8	1.3	2.8
Propane gas pressure at burner inlet	"wc	15.0	32.0	14.5	31.7
Propane gas pressure at burner test port	"wc	13.6	29.0	12.9	28.4
Propane gas pilot gas pressure at burner test port	"wc	0.5	1.1	0.3	0.8
Maximum combustion air volume required	scfm	96	144	173	259
Tube length (sized for 80% efficiency)	ft	30	34	36	38
Tube diameter (Schedule #40 pipe or lighter)	in	3	3	4	4
Packaged burner blower motor	hp	1/2	N/A	1/2	N/A
Packaged burner sound levels at 3 feet (no silencer)	dB(A)	85	N/A	86	N/A
Packaged burner sound levels at 3 feet (with silencer)	dB(A)	82	N/A	83	N/A

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft<sup>3</sup> (st) )

[2] Packaged burner capacities with 60 Hz fan. For operation on 50 Hz, reduce capacity by 17%. Fuel and air pressures should be reduced by 30%. Motor power will reduce by 40%. Packaged burners need to be ordered with the appropriate blower motor depending on 50 or 60 Hz availability.

[3] Differential combustion air pressure readings in a no-fire condition. Differential combustion air pressure readings can be used to diagnose problems such as blocked tubes or closed exhaust dampers.

NOTE: Burner performance can be drastically affected by tube configuration and static conditions within tube created by dampers in exhaust stack.

For proper burner adjustment, MAXON advises the use of an oxygen content meter. Optimal oxygen level in exhaust stack should read between 3 and 4 vol. % dry when measured with the burner operating at the maximum capacity firing rate.

## 6" TUBE-O-THERM® burners

Typical burner data			
Fuel: natural gas at 60°F with 1000 Btu/ft <sup>3</sup> (st) HHV - sg = 0.6 [1]			
Combustion air: 60°F - 21% O <sub>2</sub> - 50% humidity - sg = 1.0 [1]			
Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.			
TUBE-O-THERM® burner	Size	6" burner	
	Description	Pkgd.	EB
Maximum capacity [2]	MBtu/h	2.0	3.0
Pilot capacity	MBtu/h	0.13	0.2
Minimum capacity	MBtu/h	0.16	0.24
Natural gas pressure at burner inlet	"wc	36.5	76.4
Natural gas pressure at burner test port	"wc	29.2	62.1
Natural gas pilot gas pressure at burner test port	"wc	0.3	0.6
Combustion air pressure at burner inlet	"wc	8.4	17.1
Combustion air pressure at burner test port	"wc	5.2	12.0
Differential air pressure [3]	"wc	2.1	3.9
Propane gas pressure at burner inlet	"wc	18.0	41.0
Propane gas pressure at burner test port	"wc	15.4	33.7
Propane gas pilot gas pressure at burner test port	"wc	0.4	0.8
Maximum combustion air volume required	scfm	384	576
Tube length (sized for 80% efficiency)	ft	50	56
Tube diameter (Schedule #40 pipe or lighter)	in	6	6
Packaged burner blower motor	hp	2	N/A
Packaged burner sound levels at 3 feet (no silencer)	dB(A)	88	N/A
Packaged burner sound levels at 3 feet (with silencer)	dB(A)	84	N/A

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft<sup>3</sup> (st) )

[2] Packaged burner capacities with 60 Hz fan. For operation on 50 Hz, reduce capacity by 17%. Fuel and air pressures should be reduced by 30%. Motor power will reduce by 40% . Packaged burners need to be ordered with the appropriate blower motor depending on 50 or 60 Hz availability.

[3] Differential combustion air pressure readings in a no-fire condition. Differential combustion air pressure readings can be used to diagnose problems such as blocked tubes or closed exhaust dampers.

NOTE: Burner performance can be drastically affected by tube configuration and static conditions within tube created by dampers in exhaust stack.

For proper burner adjustment, MAXON advises the use of an oxygen content meter. Optimal oxygen level in exhaust stack should read between 3 and 4 vol. % dry when measured with the burner operating at the maximum capacity firing rate.



## 8" TUBE-O-THERM® burners

Typical burner data					
Fuel: natural gas at 60°F with 1000 Btu/ft <sup>3</sup> (st) HHV - sg = 0.6 [1]					
Combustion air: 60°F - 21% O <sub>2</sub> - 50% humidity - sg = 1.0 [1]					
Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.					
TUBE-O-THERM® burner	Size	8" burner			
	Description	Pkgd.	EB	HC	8" HC 10" tube
Maximum capacity [2]	MBtu/h	3.5	5.3	7.5	8.5
Pilot capacity	MBtu/h	0.35	0.53	0.5	0.5
Minimum capacity	MBtu/h	0.35	0.47	0.25	0.28
Natural gas pressure at burner inlet	"wc	37.0	76.0	125	144
Natural gas pressure at burner test port	"wc	33.0	72.0	110.8	139
Natural gas pilot gas pressure at burner test port	"wc	0.6	1.3	0.5	0.7
Combustion air pressure at burner inlet	"wc	9.9	24.9	29.7	27.1
Combustion air pressure at burner test port	"wc	5.1	10.7	21.4	13.7
Differential air pressure [3]	"wc	1.4	2.7	2.7	2.6
Propane gas pressure at burner inlet	"wc	18.2	44.0	61.0	69.3
Propane gas pressure at burner test port	"wc	16.5	37.0	48	61
Propane gas pilot gas pressure at burner test port	"wc	0.6	1.3	0.3	0.3
Maximum combustion air volume required	scfm	672	1018	1440	1632
Tube length (sized for 80% efficiency)	ft	64	73	84	91
Tube diameter (Schedule #40 pipe or lighter)	in	8	8	8	10
Packaged burner blower motor	hp	3	N/A	N/A	N/A
Packaged burner sound levels at 3 feet (no silencer)	dB(A)	89	N/A	N/A	N/A

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft<sup>3</sup> (st) )

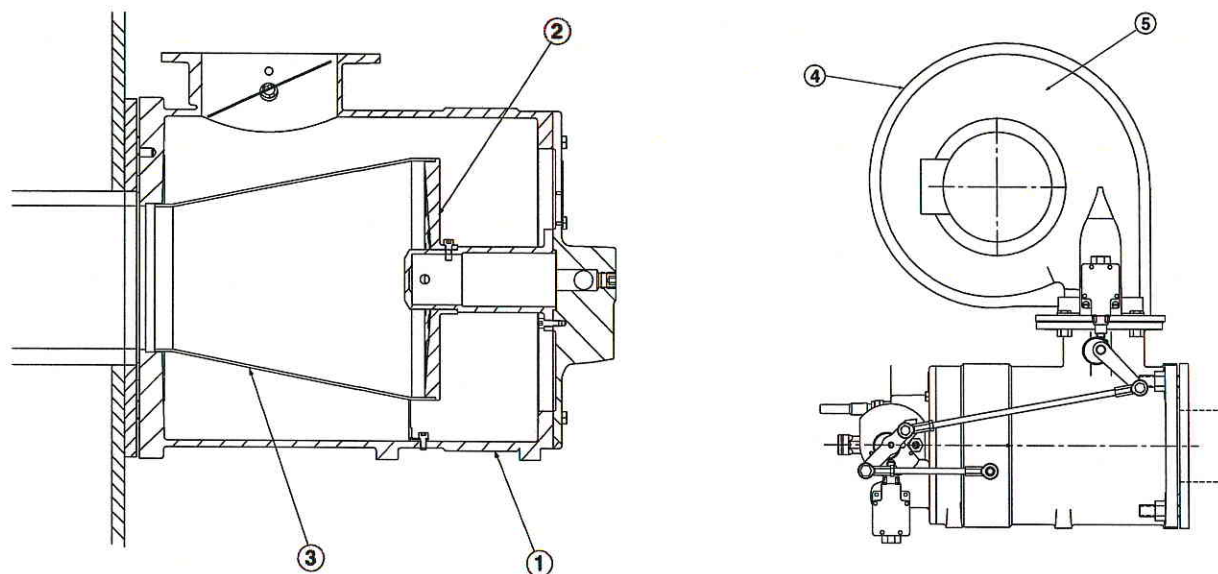
[2] Packaged burner capacities with 60 Hz fan. For operation on 50 Hz, reduce capacity by 17%. Fuel and air pressures should be reduced by 30%. Motor power will reduce by 40% . Packaged burners need to be ordered with the appropriate blower motor depending on 50 or 60 Hz availability.

[3] Differential combustion air pressure readings in a no-fire condition. Differential combustion air pressure readings can be used to diagnose problems such as blocked tubes or closed exhaust dampers.

NOTE: Burner performance can be drastically affected by tube configuration and static conditions within tube created by dampers in exhaust stack.

For proper burner adjustment, MAXON advises the use of an oxygen content meter. Optimal oxygen level in exhaust stack should read between 3 and 4 vol. % dry when measured with the burner operating at the maximum capacity firing rate.

## Materials of construction



Item number	Part	Material
1	Housing	Class 3000 gray iron
2	Air plate	Class 3000 gray iron
3	Reducing transition	304 stainless steel (1.4301)
4	Blower housing	Stamped steel
5	Impeller (inside blower)	319 cast aluminum

## Selection criteria

### TUBE-O-THERM® burner versions

Standard TUBE-O-THERM® burner package includes a combustion air blower with a non-sparking aluminum impeller. A built-in pilot and spark ignitor is included in the cast iron burner body, as well as the air and gas control valves, gas nozzle, pilot adjustable orifice and provisions for your flame detector. Burner design permits blower to be rotated at 90° intervals around centerline for application flexibility. Please refer to burner and blower dimensions to insure blower orientation is possible.

Model EB (external blower) TUBE-O-THERM® burners, like all TUBE-O-THERM® burner assemblies, provide extended capacities with remote blowers and deliver heat efficiently into your fired tube application.



Burner designation

Burner	Size	Type	Connection	Fuel	Mounting	Accessories
TOT	4	PKGD-50	ISO	NAT	WALL	FLTR-AO

**Burner**

TOT - TUBE-O-THERM burner

**Size**

3 - 3"

4 - 4"

6 - 6"

8 - 8"

8HC - 8" high capacity

**Type**

PKGD-50 - Packaged: includes combustion air blower 50 Hz

PKGD-60 -Packaged: includes combustion air blower 60 Hz

EB - External blower: combustion air blower not included with burner

**Connection**

ANSI - ANSI threaded connection for gas

ISO - ISO threaded connection for gas

**Fuel**

BUT - Butane

NAT - Natural gas

PROP - Propane

**Mounting**

WALL - Wall mounted including wall mounting plate

WALL\_NOFLG - Wall mounted excluding wall mounting plate

**Accessories**

FLTR - Combustion air filter

FLTRSLNCR - Filter/silencer combination

AO - Pilot gas adjustable orifice

AD - Combustion air adapter (for EB types only)

Application details

Typical applications are industrial solution heating jobs such as dip tanks, spray washers, pickling or quench tanks and salt baths. TUBE-O-THERM® burners may also be used with proper design for indirect air heaters and bakery ovens.

Temperature limitations

TUBE-O-THERM® burner internal components include Rulon bearings which have a maximum temperature limit of 500°F. At no time should combustion air inlet temperatures exceed this temperature.

Consider the temperature limit of the blower motor, the control actuator, the flame detector, and other electrical components when establishing the maximum ambient temperature around TUBE-O-THERM® burners. Most electrical devices are not suitable for ambient temperatures in excess of 140°F.

Combustion air oxygen content

The combustion air inlet to TUBE-O-THERM® burners should be located so that it consumes fresh, clean air with 20.9% oxygen. Avoid locating combustion air inlets near process exhaust outlets, volatile fumes or other inert gaseous materials.

If the TUBE-O-THERM® is used for indirect heating of air streams or process gases, avoid firing the burner when the process stream is not present to cool the fire tube array. Careful design of the fire tube array is required in these applications for expansion and temperature management.

Piloting & ignition

Pilot piping and regulator should be sized carefully for the full pilot and capacity shown on pages 1-2.1-7 to 9. Pilot regulator pressure range should match the pressure range used for the main gas regulator. This will eliminate the possibility of chattering in the pilot regulator when the main gas (higher pressure) is at high fire and the burner operates with continuous pilot. If burner controls are set to operate with interrupted pilot, chattering would not be a concern.

NOTE: The best option is to run the pilot interrupted. If the pilot is not interrupted, catalog minimums cannot be obtained. Some local codes may not allow the use of a continuous pilot. Mount pilot valve as close to the burner as possible. The pilot valve should be able to take 200" wc pressure at its outlet.

Refer to pages 1-2.1-7 to 9 for the proper pilot gas pressure as measured at the burner gas test port. The adjustable orifice inside the pilot can be used to establish the required pressure (5/32" hex wrench required). The pilot solenoid should be located close to the burner to allow gas to reach burner before flame safeguard "times out".

The self-piloting feature of the burner allows pilot gas to bypass the internal gas control valve and issue from the main gas nozzle ports.

Low fire start: Main flame light-off is possible above minimum fire position, but a larger pilot will be required and turndown may be sacrificed if control design does not allow different light off and minimum positions. Direct ignition is feasible at capacities larger than full minimum. Again, turndown will not be sacrificed if control is separate for light off and minimum positions.

#### Ratio control

The TUBE-O-THERM® burner combustion air and fuel gas controls are factory-set and characterized to provide proper air/fuel ratios at specific supply pressures. Use combustion air blowers with relatively flat static pressure profiles (+/- 10%).

Regardless of the type of automatic control (high-low or modulating), TUBE-O-THERM® burners should not exceed 15% of maximum rating for pilot ignition and/or main flame light-off.

The built-in air and gas flow control valves are mechanically linked together. At low capacity, the air valve is slightly open but the gas valve is practically closed.

If some higher firing rate is selected for low fire on high-low installations, both valves will be opened wider. The increased combustion air will necessitate more gas for pilot ignition.

The burner's maximum output may be limited by adjusting the linkage to the actuator motor. In these under-fired conditions, size combustion air blower to full maximum capacity due to the linkage profile and expected blower characteristic.

The TUBE-O-THERM® burner was designed to accept a variety of electric modulating motors. Contact MAXON for application details of your preferred actuator.

For more accurate gas/air ratio control, use MAXON SMARTLINK® MRV or MICRO-RATIO® valves on TUBE-O-THERM® burners without internal air/gas valves.

#### Typical ignition sequence

- Pre-purge of burner and installation, according to the applicable codes and the installation's requirements.
- Combustion air control valve shall be in the minimum position to allow minimum combustion air flow to the burner.
- Pre-ignition (typically 2s sparking in air).
- Open pilot gas and continue to spark the ignitor (typically 5s).
- Stop sparking, continue to power the pilot gas valves and start flame check. Trip burner if no flame can be detected from here on.
- Check pilot flame stability (typically 5s) to prove the stable pilot.
- Open main gas valves and allow enough time to have main gas in the burner (typically 5s + time required to have main gas in the burner).
- Close the pilot gas valves.
- Release to modulation (allow modulation of the burner).

Above sequences shall be completed to include all required safety checks during the start-up of the burner (process & burner safeties).

#### Flame supervision

The TUBE-O-THERM® burner will operate with a variety of flame detectors for all burner sizes. Flame rods are not available. Contact MAXON for specific questions on flame detection.



## Piping

Main gas train should be sized to give no more than 6" wc pressure drop between gas pressure regulator and burner inlet to obtain catalog minimums. It is recommended to size the regulator for capacity at the required pressure, carefully considering pipe train losses.



**Do not size fuel trains to match burner inlet thread sizes. Inlet fuel threads are typically different than a correctly sized fuel train. Reduction to the burner inlet thread size should be made as close to the burner as possible.**

## Fuels

Natural gas, propane, butane and other commercially available fuel gases can be used. Fuel pressures in capacity tables are listed for natural gas and propane gas. Adjust operating fuel pressures and flows according to your fuel.

## Expected emissions

TUBE-O-THERM® burners utilize rapid mixing of fuel and air to suppress formation of NOx. Typical NOx formation from the burner will be 30-40% less than conventional burners.

With lower levels of excess air than many tube burners, the TUBE-O-THERM® also controls the production of CO to low levels at most of its firing rate. Higher levels of excess air are used at lower firing rates to prevent condensation in the fire tube which elevates CO production at minimum and idle input. Expect little or no CO at high firing rates with low fire CO production determined by process parameters.

Exact emissions performance may vary in your application. Contact MAXON for information on installation specific estimates or guarantees. No guarantee of emissions is intended or implied without specific written guarantee from MAXON.

## Tube length and configuration

Tube design should consist of a specified length of Schedule #40 pipe or lighter in the same size as burner (unless specified otherwise). Tubes may be constructed of iron, steel, or stainless steel. It is possible to fire TUBE-O-THERM® burners into tube diameters larger than the size designation. Contact your MAXON representative for further information on tube sizing or material selection.

MAXON suggests that the first straight pass of tube consist of the minimum length shown below for each tube size. Burner capacity may be reduced if tube layout has multiple miter turns.

Burner size	Recommended first pass length
3" & 4"	15 pipe diameters minimum
6" & 8"	10 pipe diameters minimum

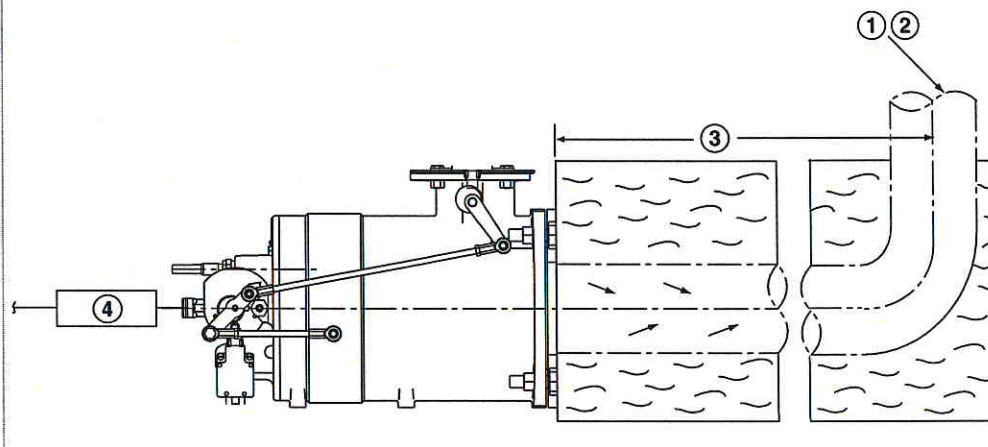


**Firing tube length and resulting wetted tube surface area determines combustion transfer efficiency. Refer to efficiency vs. tube length charts on page 1-2.1-16 through 18.**

Many factors affect overall system efficiency. Typical installations run in the 70% to 80% range. Space considerations (including tube displacement) may limit possible tube lengths and reduce efficiency. Above 80% efficiency, there is a risk of condensation-caused tube damage.

Typical installation

- 1) Stack dampers optional
- 2) Tank & fire tube (by others)
- 3) First pass length
- 4) Gas train



Small bore immersion tubes can be sized for efficiencies lower than 80% if tank space is limited or if complete freedom from tube condensation is desired.

NOTE: Schedule 40 pipe should be used for at least the first 2 feet of tube length.

#### Tube exhaust requirements



**WARNING: Failure to follow the recommended exhaust considerations could result in poor burner performance and/or corrosion of the fired tube due to condensation.**

Historically, conventional immersion tube burners were sized for 70% efficiency, since this percentage provided a compromise between operating fuel economy and tube length.

Small-bore tubes require less space than conventional tubes. Therefore, small-bore tubes can be made longer to provide efficiencies of 80% or more.

Tubes sized for 80% efficiency will have low exhaust temperatures, causing condensation to form in them during start-up or during long idling periods. This condensation will normally evaporate after the burner has run at high fire for a brief period of time. If extended idling periods are expected, a condensate drain should be provided at the low point nearest the exhaust and the immersion tube should be pitched towards the exhaust.

If the immersion tube will operate at efficiencies of 75% or lower, the exhaust leg can exit through the liquid surface in the tank without designing for condensation. However, the length of the exhaust tube must also be considered in the design as explained below.

These considerations also extend to the exhaust lengths after the tube exits the liquid surface. An exhaust tube exiting the tank will continue to transfer heat and cool the products of combustion to their condensation point. Therefore, an atmospheric break or dilution tee should be used. By doing so, the diluting atmospheric air will depress the dewpoint temperature of the combustion products so that they may exhaust out of the plant with minimal condensation.

If the dilution tee option is chosen, there must be safeguards to ensure that the diluting air is not restricted or blocked. If this were to occur, condensation inside the stack could result, with condensate flowing downward to the low point in the tube, possibly blocking the tube and causing burner instability.



**Because of the high firing rates possible with this burner and the low cross-sectional area of the tubes, no draft or chimney effect should be designed for, or expected. If an optional exhaust stack damper is used, size the damper for 85% of the area of the stack.**





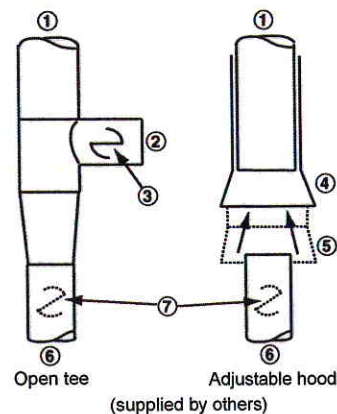
**Note that TUBE-O-THERM® burners release heat beginning at the burner mounting surface. In most cases, the fire tube must be fluid backed. Extension stubs or insulated fire tube entries are not recommended and risk thermal damage to the burner, structure and the tube.**

Immersion tubes are usually vented to the outdoors, except for those in highly ventilated areas such as a plating room with continuous high-volume exhaust. An exhaust fan is generally not required but may be used in cases of high building negative pressure. Exhaust is normally diluted to avoid the need for high-temperature fans, but adequate make-up air must be available.

This diluting can be done with an open tee installed in a vertical run (or in a horizontal run with the open end down), but such a system mixes slowly.

An adjustable hood (shown in sketch below) offers much better performance. In all cases, care must be taken that all products of combustion are exhausted from the building.

- 1) To outdoors or exhaust fan
- 2) Diluting air tee
- 3) All adjustments to be locked in position
- 4) Adjustable hood
- 5) Diluting air
- 6) Immersion tube
- 7) Exhaust stack damper



**Cross-sectional area of the exhaust hood should be a minimum of 1.5 times the fired tube cross-sectional area.**

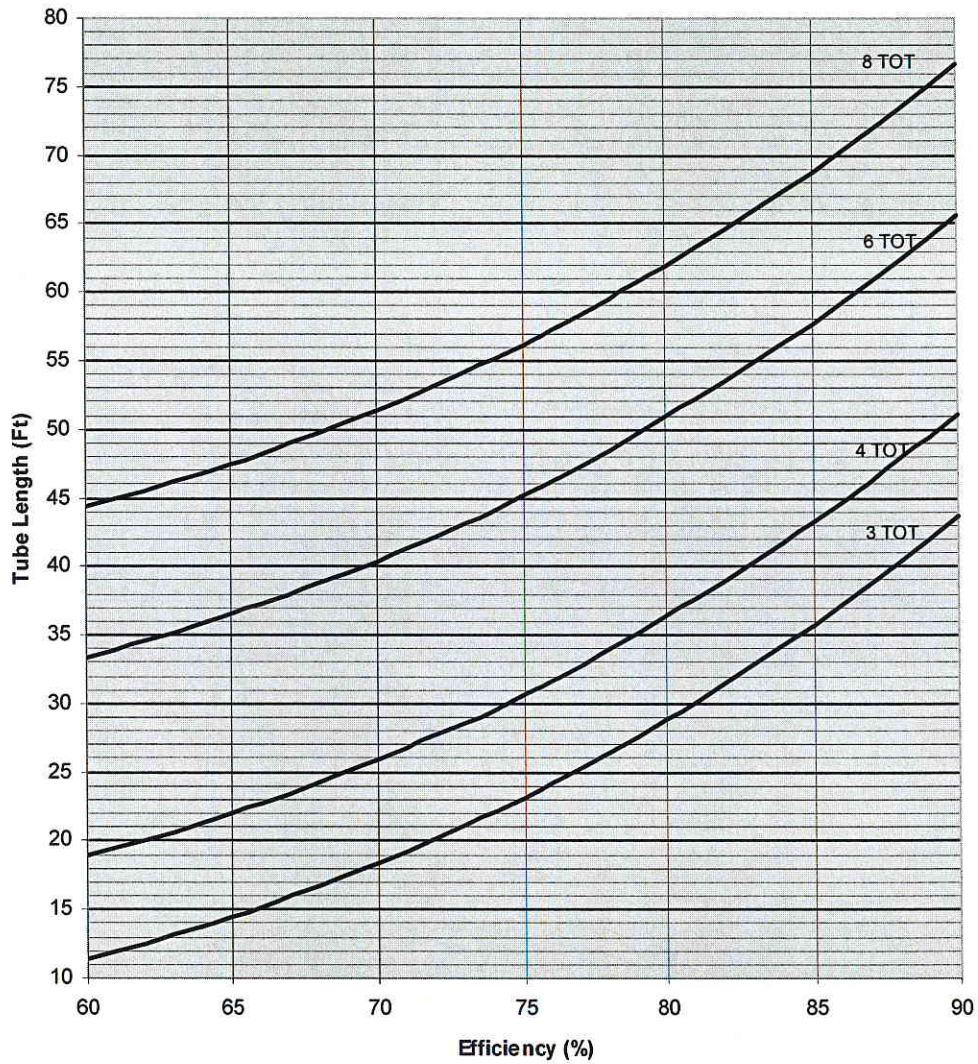
**Because of the high firing rates possible with this burner and the low cross-sectional area of the tubes, no draft or chimney effect should be designed for, or expected. If an optional exhaust stack damper is used, size the damper for 85% of the area of the stack. The use of an exhaust stack damper could also help solve resonance in some cases.**

1-2.1-16  
E-i-3/12

TUBE-O-THERM® Low Temperature Gas Burners

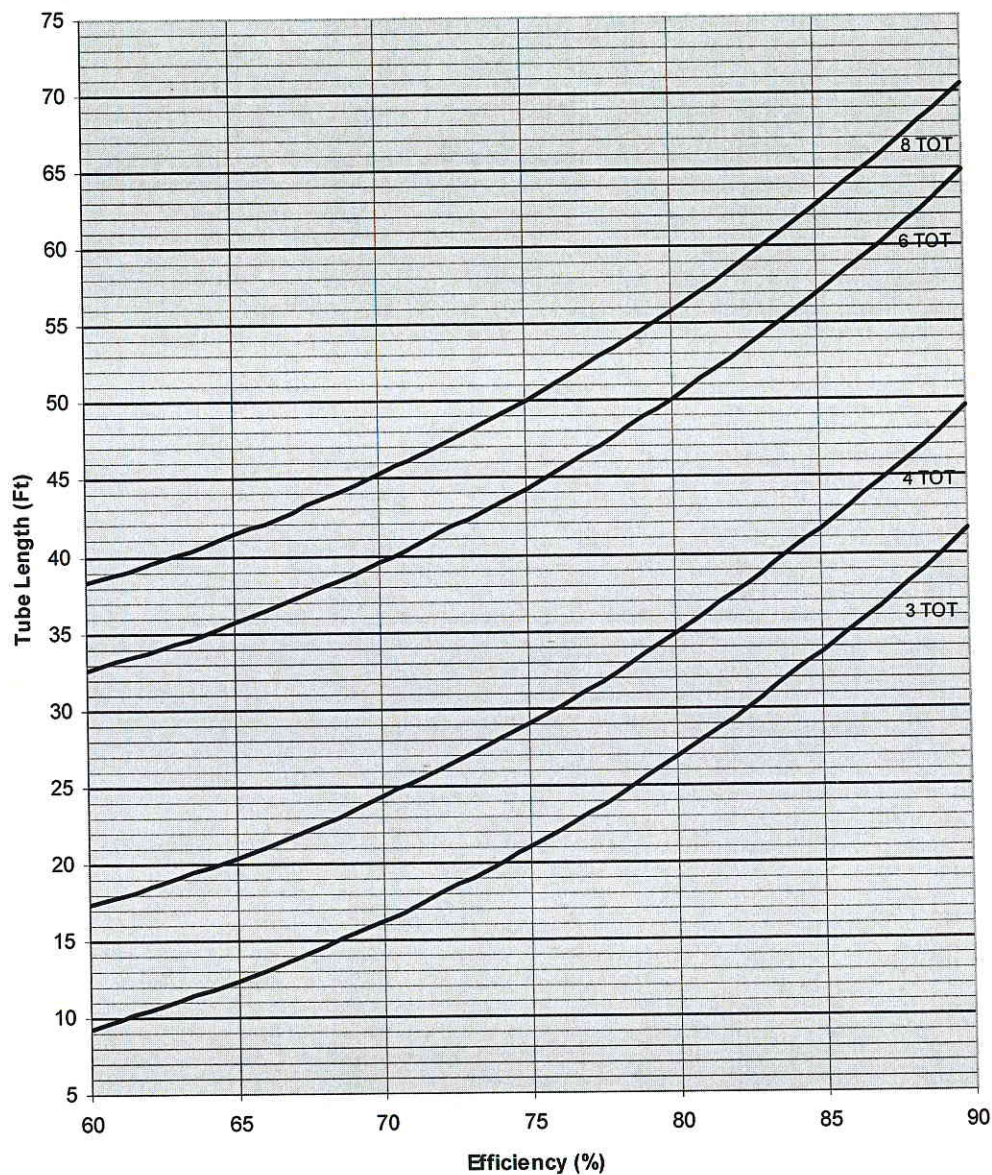
Immersion tube sizing

60 Hz Pkgd TOT Efficiency



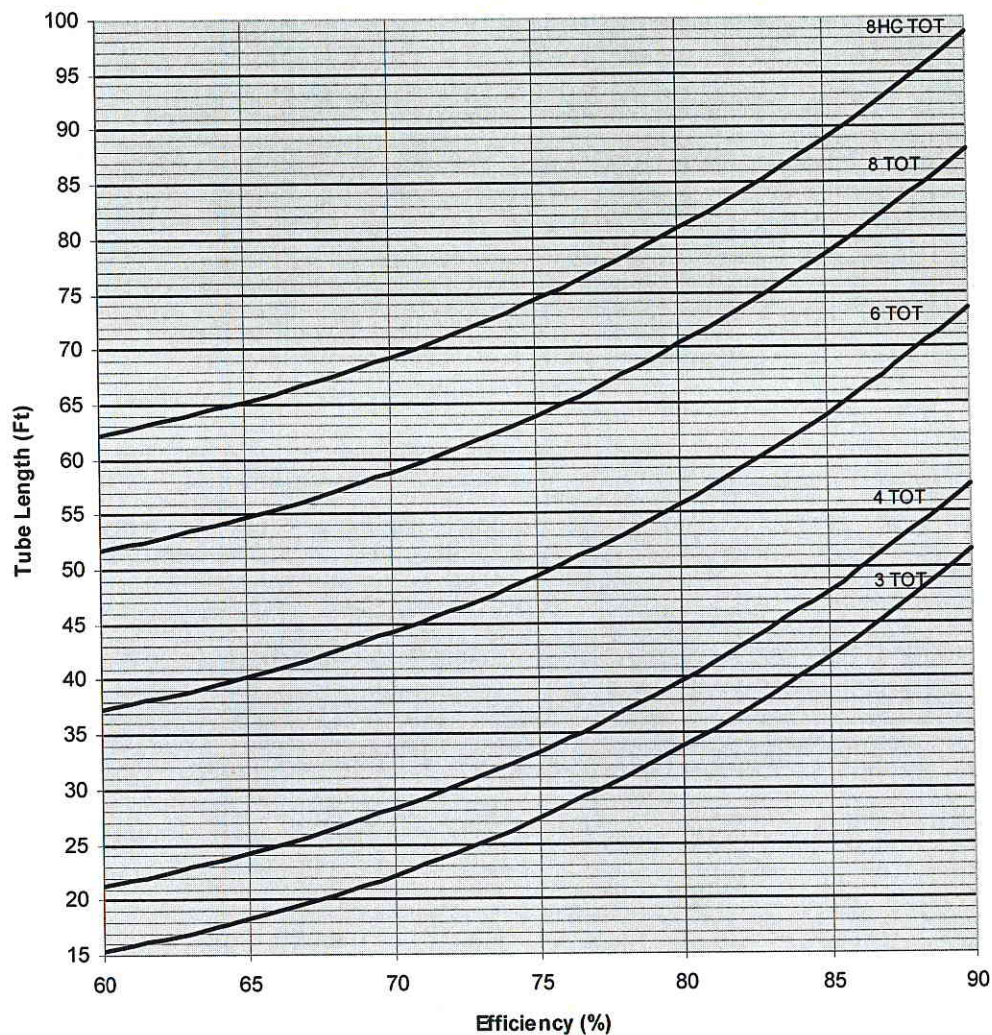


50 Hz Packaged TOT Efficiency





## EB TOT Efficiency



- Systems sized for 80% efficiencies or higher need to account for condensation during extended idling periods. Refer to Selection Criteria on pages 1-2.1-10.
- Use the centerline lengths of elbows when computing total tube length.
- Note that longer tube lengths are required to achieve the same efficiency on external blower (EB) versions. This is due to increased maximum firing rate.
- When a burner will not be firing at its maximum capacity, the tube length will decrease to maintain the same efficiency. Contact MAXON for tube length calculations in these cases.

#### Indirect firing

---

Tube sizing charts are applicable only to liquid-backed immersion tubes. Indirect-fired applications (non-liquid backed fired tubes) could require additional length depending on the specific application. For indirect firing in moving air streams, the tube sizing charts will look different. Contact MAXON for more details on these applications.

Recommended air stream velocity across fired tubes is 2000 to 3000 fpm .

#### Multiple burner arrangement

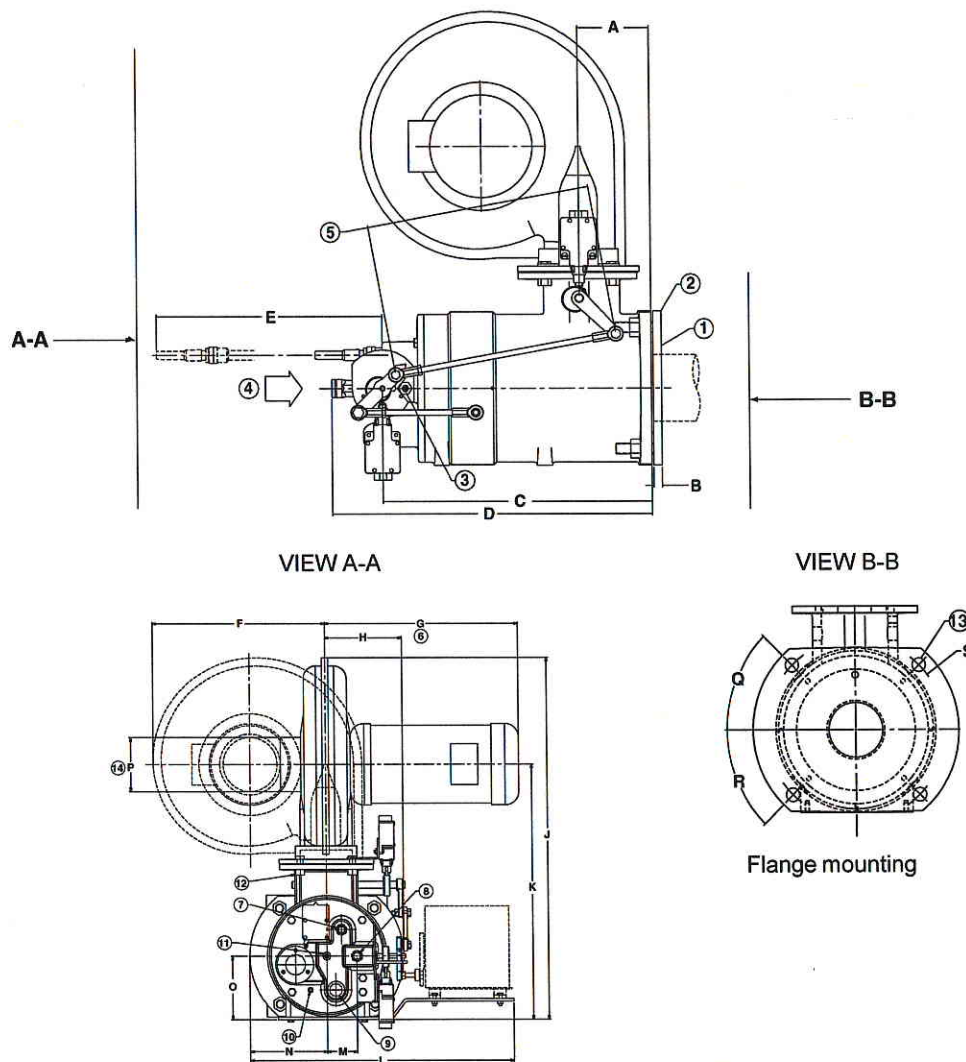
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Multiple burner installations fed by a single pipe train should incorporate a balancing valve and a swing check valve installed as close as possible to each burner gas inlet for improved heating uniformity and more dependable light-off. Otherwise, gas manifold may act as a reservoir, preventing reliable light-off during trial for ignition period of your control panel sequence.

**Dimensions and weights****3" packaged TUBE-O-THERM® burner**

- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) Gas test connection 1/8"
- 4) Gas inlet
- 5) This dimension is critical for proper operation and must be held  $13.113 \pm 0.3$
- 6) Motor may change based on availability. Size will not exceed dimension shown.
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1/2"
- 9) Scanner connection 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M16
- 14) Air inlet

Threaded connections are available in NPT or ISO, depending on the burner type



Dimensions in inches unless stated otherwise									
A	B	C	D	E [1]	F	G	H	J	K
4.2	0.5	15.8	18.8	10.5	13.4	14.38	5.8	26.5	19.0

L	M	N	O	P Ø	Q	R	S Ø	Weight lbs
19.6	2.25	5.8	4.9	4.0	45°	45°	10.0	145

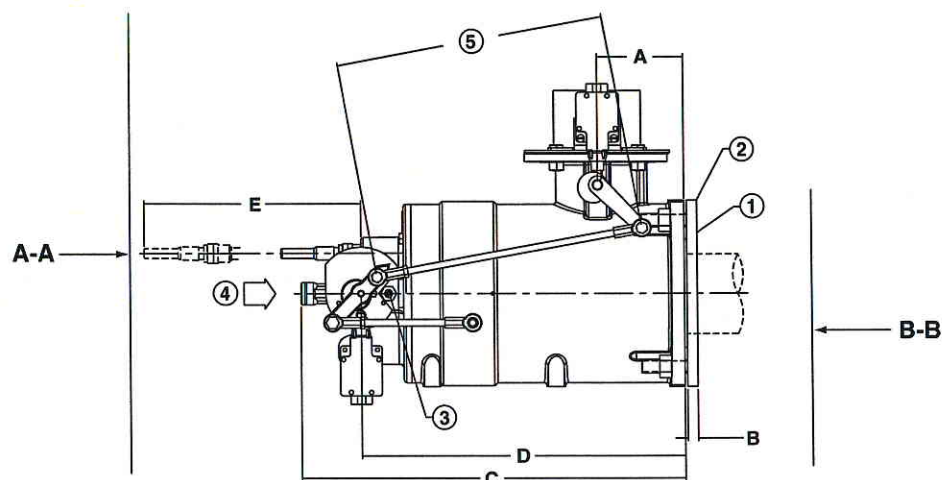
[1] Required dimension for ignitor removal



## 3" EB (external blower) TUBE-O-THERM® burner

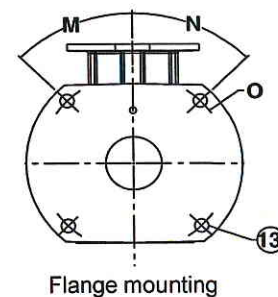
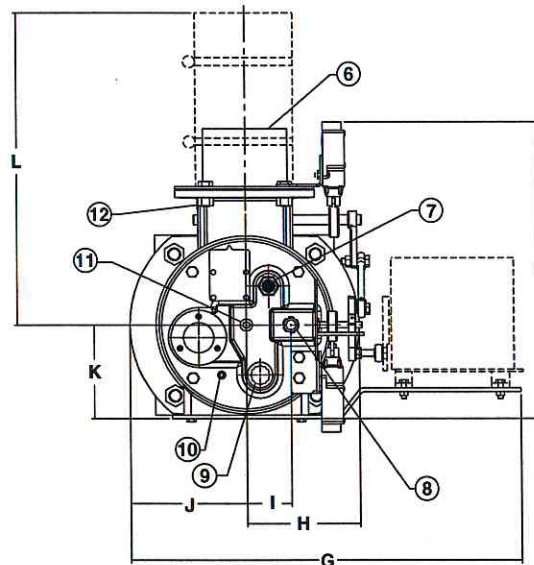
- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) 1/8" gas test connection
- 4) Gas inlet
- 5) This dimension is critical for proper operation and must be held 13.592 ±.03
- 6) Air inlet
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1/2"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M16

Threaded connections are available in NPT or ISO, depending on the burner type



VIEW A-A

VIEW B-B



Dimensions in inches unless stated otherwise

A	B	C	D	E [1]	F	G	H
4.2	0.5	18.72	15.75	10.5	15.4	19.6	5.8

I	J	K	L	M	N	O Ø	Weight lbs
2.25	5.8	4.9	15.6	45°	45°	10.0	105

[1] Required dimension for ignitor removal

W W W . M A X O N C O R P . C O M

COMBUSTION SYSTEMS FOR INDUSTRY

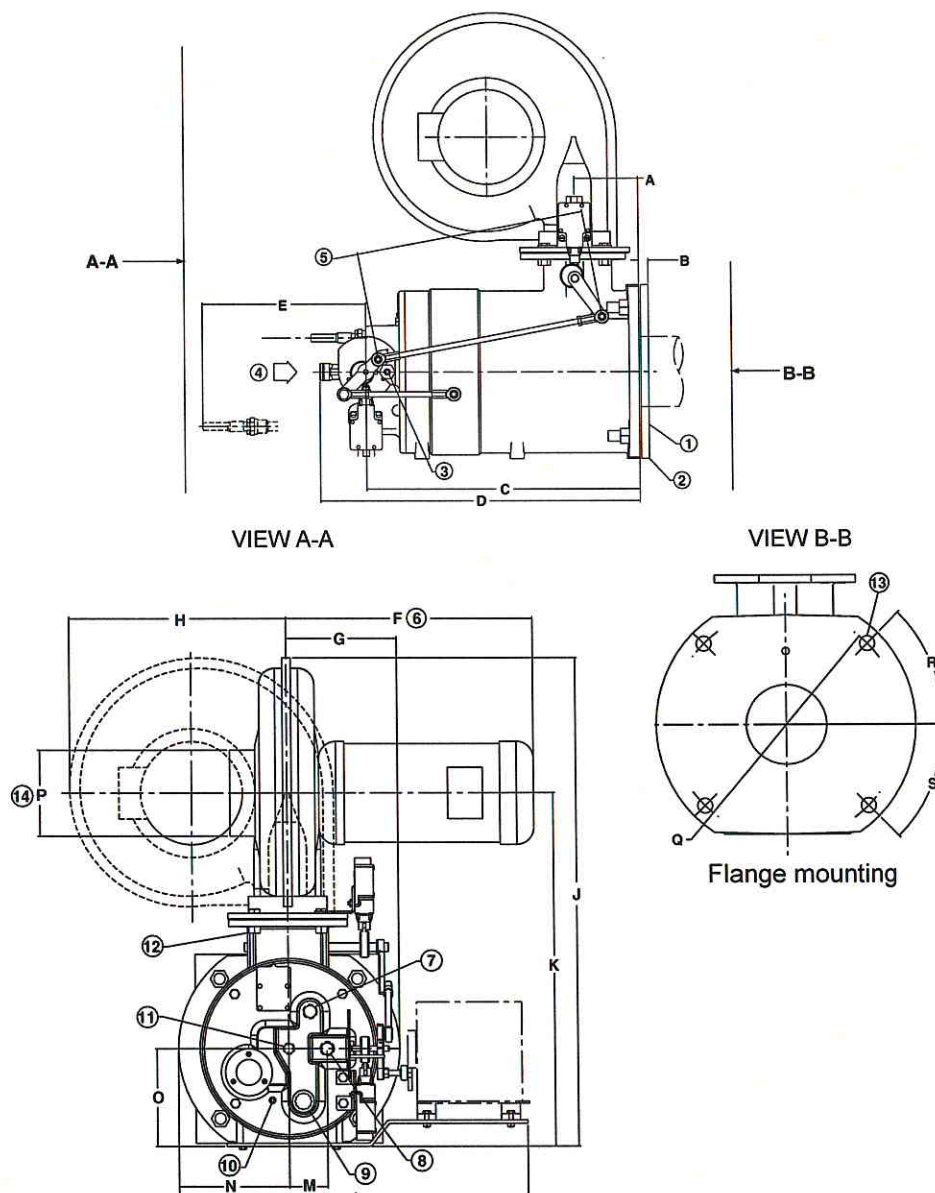
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**MAXON**  
A Honeywell Company

## 4" packaged TUBE-O-THERM® burner

- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) Gas test connection 1/8"
- 4) Gas inlet
- 5) This dimension is critical for proper operation and must be held  $14.5 \pm 0.3$
- 6) Motor may change based on availability. Size will not exceed dimension shown.
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1/2"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud
- 14) Air inlet

Threaded connections are available in NPT or ISO, depending on the burner type



Dimensions in inches unless stated otherwise

A	B	C	D	E [1]	F	G	H	J	K
4.1	0.5	17.5	20.34	10.5	14.38	6.5	12.7	28.8	20.9

L	M	N	O	P Ø	Q Ø	R	S	Weight lbs
20.4	2.5	6.5	5.7	5.0	11.5	45°	45°	170

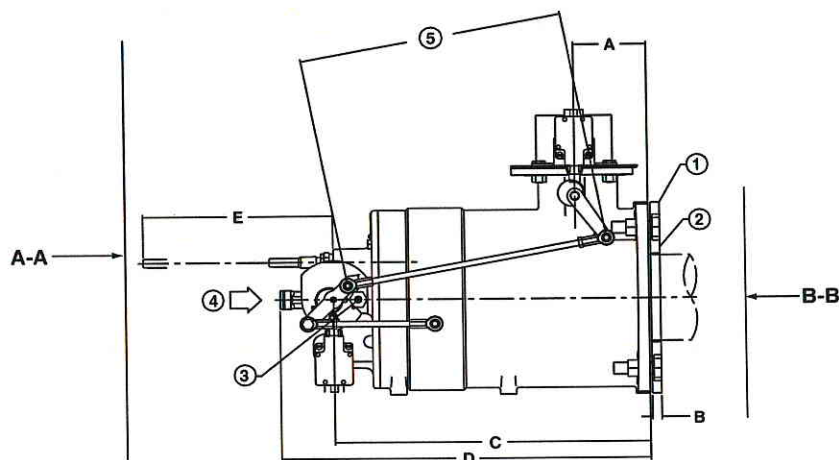
[1] Required dimension for ignitor removal



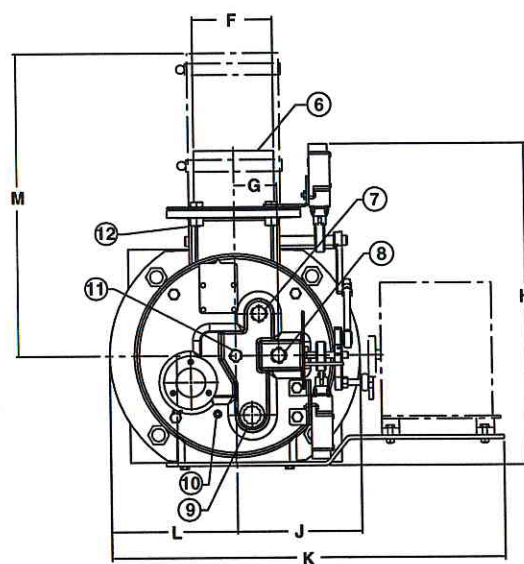
## 4" EB (external blower) TUBE-O-THERM® burner

- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) 1/8" gas test connection
- 4) Gas inlet
- 5) This dimension is critical for proper operation & must be held  $14.5 \pm .03$
- 6) Air inlet
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1/2"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/4"
- 12) Combustion air test connection 3/4"
- 13) Recommended mounting stud M16

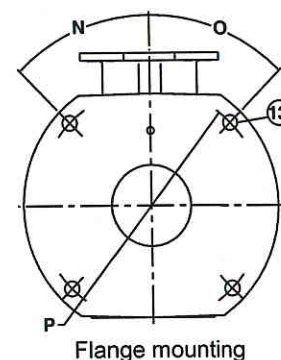
Threaded connections are available in NPT or ISO, depending on the burner type



VIEW A-A



VIEW B-B



Flange mounting

Dimensions in inches unless stated otherwise

A	B	C	D	E [1]	F Ø	G	H
4.1	0.5	17.5	20.34	10.5	4.0	2.25	16.90

J	K	L	M	N	O	P Ø	Weight lbs
6.5	20.38	6.5	15.92	45°	45°	11.5	132

[1] Required dimension for ignitor removal

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COMBUSTION SYSTEMS FOR INDUSTRY

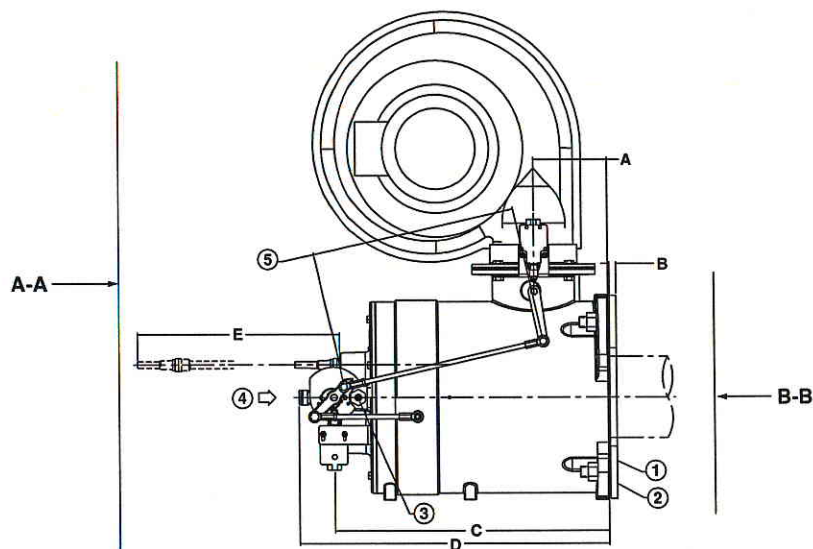
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## 6" packaged TUBE-O-THERM® burner

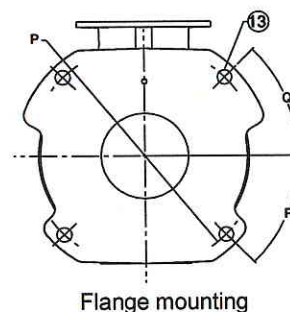
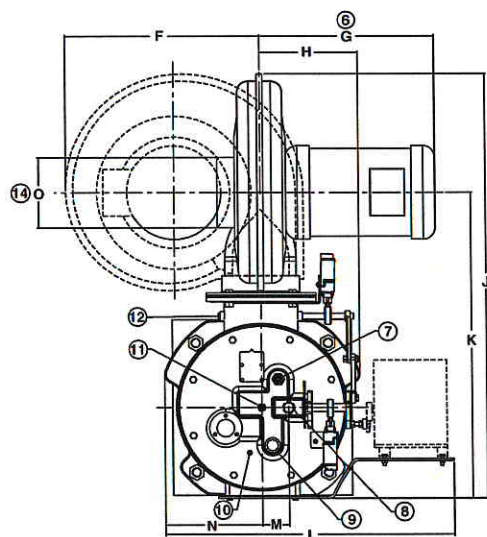
- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) 1/4" gas test connection
- 4) Gas inlet
- 5) This dimension is critical for proper operation & must be held  $15.234 \pm 0.03$
- 6) Motor may change based on availability. Size will not exceed dimension shown.
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 3/4"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M20
- 14) Air inlet

Threaded connections are available in NPT or ISO, depending on the burner type



VIEW A-A

VIEW B-B



Flange mounting

Dimensions in inches unless stated otherwise

A	B	C	D	E [1]	F	G	H	J
5.5	0.5	20.5	23.03	15.0	16.4	14.625	8.2	36.3

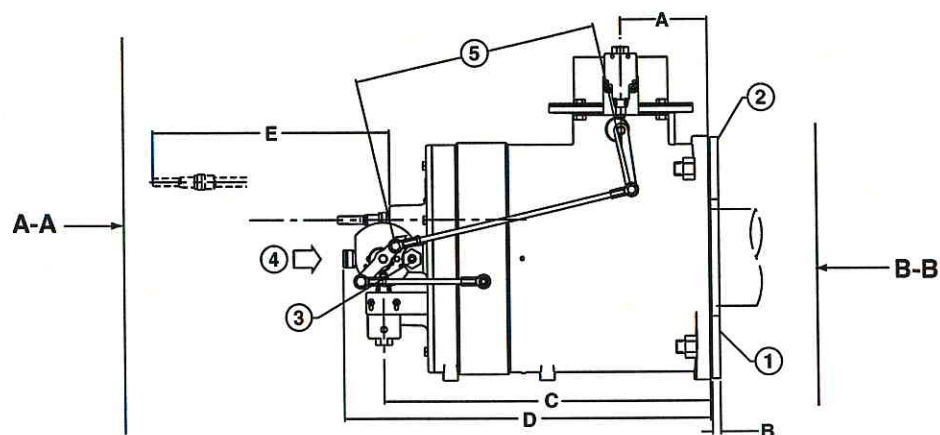
K	L	M	N	O Ø	P Ø	Q	R	Weight lbs
26.1	24.25	2.25	8.2	6.0	15.62	45°	45°	265

[1] Required dimension for ignitor removal

## 6" EB (external blower) TUBE-O-THERM® burner

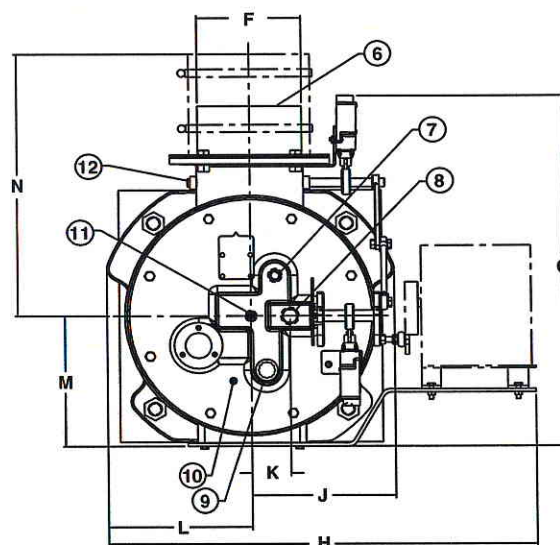
- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) Gas test connection 1/8"
- 4) Gas inlet
- 5) This dimension is critical for proper operation & must be held  $15.234 \pm 0.3$
- 6) Air inlet
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 3/4"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M20

Threaded connections are available in NPT or ISO, depending on the burner type



VIEW A-A

VIEW B-B



Flange mounting

Dimensions in inches unless stated otherwise

A	B	C	D	E [1]	F Ø	G	H	J
5.5	0.5	20.49	23.03	15.0	6.0	20.86	24.25	8.2

K	L	M	N	O	P	Q Ø	Weight lbs
2.25	8.2	7.75	15.6	45°	45°	15.62	200

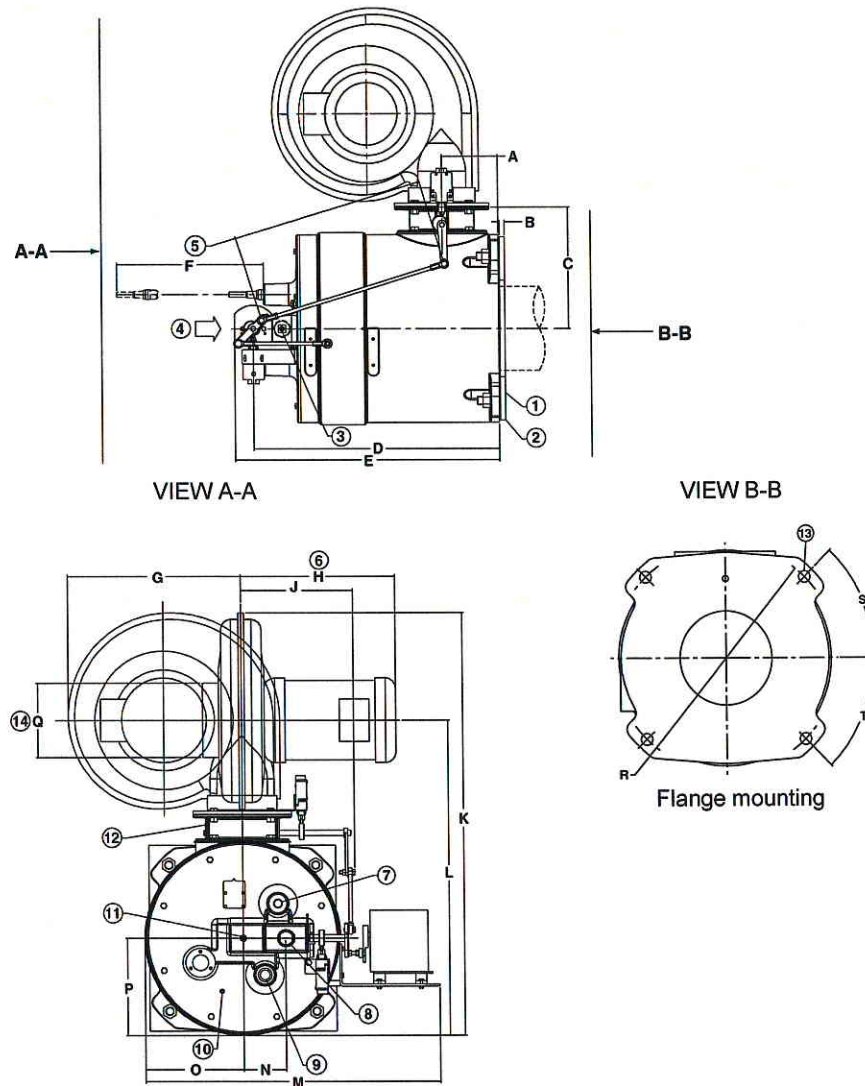
[1] Required dimension for ignitor removal



## 8" packaged TUBE-O-THERM® burner

- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) Gas test connection 1/8"
- 4) Gas inlet
- 5) This dimension is critical for proper operation & must be held  $18.625 \pm .03$
- 6) Motor may change based on availability. Size will not exceed dimension shown.
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1-1/4"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M20
- 14) Air inlet

Threaded connections are available in NPT or ISO, depending on the burner type



Dimensions in inches unless stated otherwise

A	B	C	D	E	F [1]	G	H	J	K
5.4	0.5	11.6	23.75	25.5	14.0	16.4	14.62	10.55	39.9

L	M	N	O	P	Q Ø	R Ø	S	T	Weight lbs
29.72	27.8	4.0	9.2	9.2	7.0	19.5	45°	45°	370

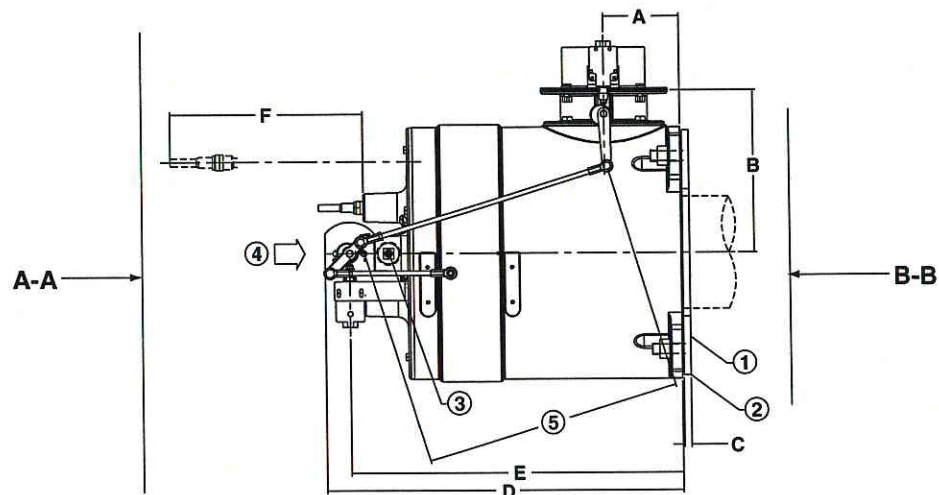
[1] Required dimension for ignitor removal

## 8" EB (external blower) HC TUBE-O-THERM® burner

This drawing is valid for 8" EB, 8" HC on 8" tube, and 8" HC on 10" tube

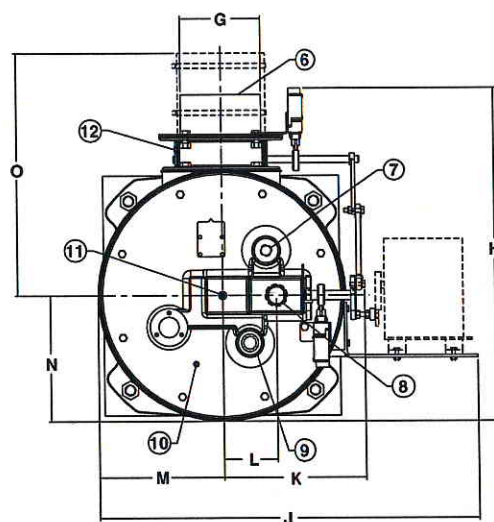
- 1) Mounting plate
- 2) Continuous weld mounting plate to tank wall
- 3) Gas test connection 1/8"
- 4) Gas inlet
- 5) This dimension is critical for proper operation & must be held  $18.7 \pm .03$  for EB and  $18.0 \pm .03$  for HC
- 6) Air inlet
- 7) Spark ignitor location 1/2"
- 8) Main gas inlet 1-1/4"
- 9) Scanner location 3/4"
- 10) Air test connection 1/8"
- 11) Pilot gas inlet 3/8"
- 12) Combustion air test connection 1/8"
- 13) Recommended mounting stud M20

Threaded connections are available in NPT or ISO, depending on the burner type



VIEW A-A

VIEW B-B



Flange mounting

Dimensions in inches unless stated otherwise

A	B	C	D	E	F [1]	G Ø	H	J
5.4	11.61	0.5	25.5	23.75	14.0	6.0	24.29	27.8

K	L	M	N	O	P	Q	R Ø	Weight lbs
10.52	4.0	9.2	9.2	17.68	45°	45°	19.5	294

[1] Required dimension for ignitor removal

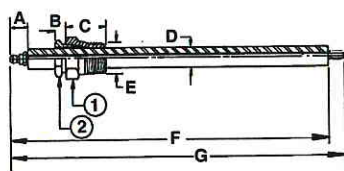
1 - 2.1 - 28  
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## TUBE-O-THERM® Low Temperature Gas Burners

### Accessories

#### Spark ignitor

- 1) 15/16" hex
- 2) 13/16" hex

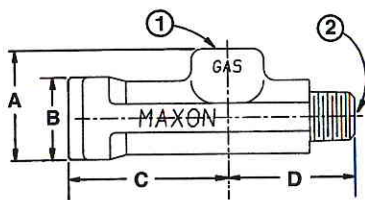


Dimensions in inches unless stated otherwise

Burner size	A	B	C	D Ø	E NPT	F	G
3" & 4"	0.5	0.19	1.15	0.562	1/2"	8.75	9.0
6" & 8"	0.5	0.19	1.15	0.562	1/2"	12.25	12.5

#### Pilot gas adjustable orifice

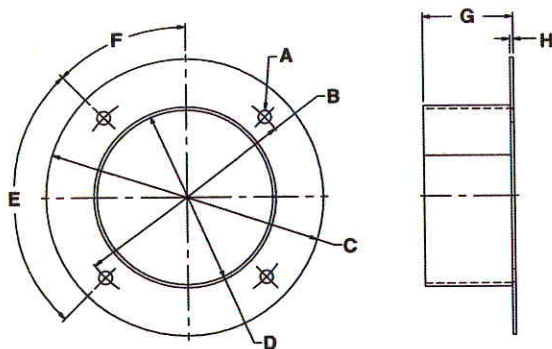
- 1) 3/8" NPT gas inlet
- 2) 3/8" NPT outlet



Dimensions in inches unless stated otherwise

A	B Ø	C	D
1.25	1.0	1.75	1.25

#### EB adapter flange

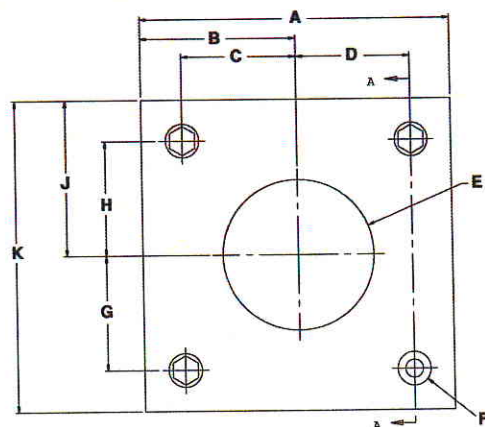


Dimensions in inches unless stated otherwise

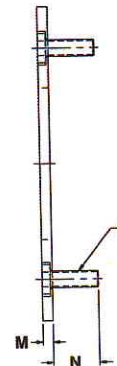
Burner size	A Ø	B Ø	C Ø	D Ø	E	F	G	H
3" & 4"	0.437	5.578	7.0	4.0	90°	45°	3.0	0.105
6" & 8"	0.437	7.5	9.188	5.790	90°	45°	3.0	0.105



## Wall mounting plate



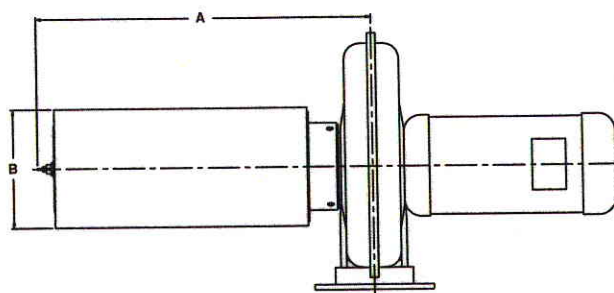
Section A-A



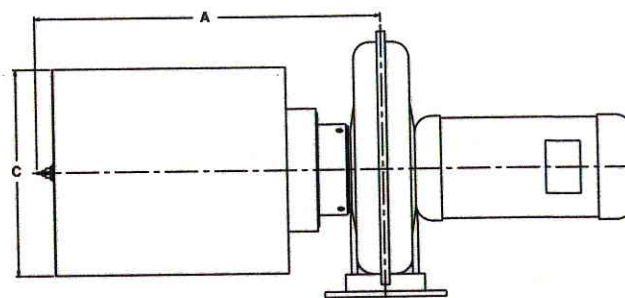
Dimensions in inches unless stated otherwise

Burner size	A	B	C	D	E Ø	F Ø	G	H	J	K	L	M	N
3"	9.0	4.5	3.5	3.5	4.125	0.718	3.5	3.5	4.5	9.0	2.0	0.5	2.244
4"	11.0	5.5	4.066	4.066	5.125	0.718	4.066	4.066	5.5	11.0	2.0	0.5	2.244
6"	15.0	7.5	5.525	5.525	7.25	0.875	5.525	5.525	7.5	15.0	2.5	0.5	2.244
8"	17.5	8.75	6.894	6.894	9.25	0.875	6.894	6.894	8.75	17.5	2.5	0.5	2.244

## Foam filter and filter/silencer



Foam filter



Foam filter/silencer

Dimensions in inches unless stated otherwise

Burner size	A	B Ø	C Ø
3"	20.3	7.0	11.8
4"	19.7	7.0	11.8
6" & 8"	27.2	9.0	16.38

## Installation and operating instructions for TUBE-O-THERM® burners

### Application requirements

#### Support burner air and gas piping

Burner and pipe manifold support will be required to support weight of the burner and connected pipe train components. Pneumatic control actuators, in particular, require additional support. MAXON connecting base and linkage assemblies are designed to position the actuators to work with the burner, not to support their weight.

The TUBE-O-THERM® burner may require external auxiliary support provided by the user. Additional burner support may be required in conjunction with a stiffener plate when mounting TUBE-O-THERM® Burner onto tube or thin tank walls.

### Installation instructions

#### Storage of TUBE-O-THERM® burners

TUBE-O-THERM® burners shall be stored dry (inside).

#### Handling of TUBE-O-THERM® burners

TUBE-O-THERM® burners are shipped as complete units. Handle burners with care during unpacking, transport, lifting and installation. Use proper equipment. Any impact on the burner could result in damage.

#### Flange the burner to the installation

Bolt the burner to the installation's burner mounting flange. Use proper gasketing. Tighten the flange bolting with correct torque. Retighten all bolts after first firing and regularly after commissioning.

#### Burner mounting

Horizontal mounting of the burner is preferred, but burner may be mounted in any position suitable for automatic control motor and UV scanner.

After placing burner in position, add lock washers and nuts, then draw up hand-tight only. Check that burner is centered, then tighten all nuts firmly.

For proper performance of any burner, air inlet and motor should be surrounded by clean, fresh, cool air.

The TUBE-O-THERM® burner was designed to transfer heat to your process as efficiently as possible. As a result, your process tube, which bolts to the outlet of the TUBE-O-THERM® burner, can become hot during the burner's operation.

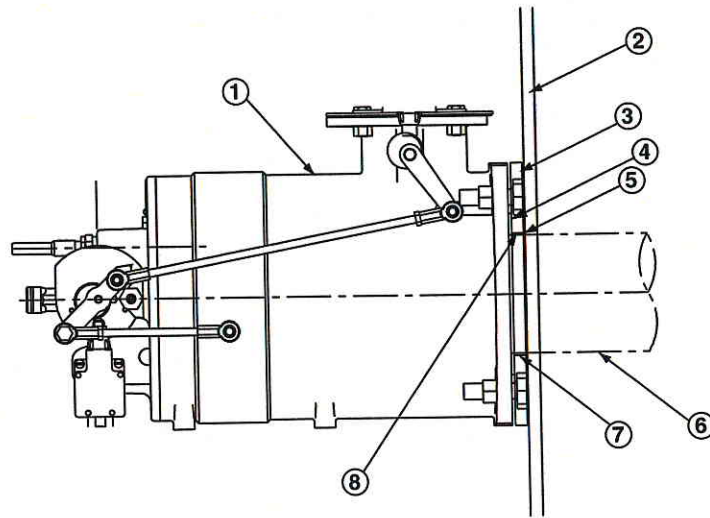
MAXON suggests using a burner support independent of the flange if tank walls are thin or if machine vibration is typical or expected. Consult your MAXON representative for more information.

#### To install the wall mounting

- Insert the immersion tube through the tank wall, making sure that it extends no more than 1/2" past the outside of the wall (the tube should be as flush as possible with the wall mounting plate once it is installed).
- Weld the immersion tube to the tank wall.
- Slip the wall mounting plate over the immersion tube (with the screw heads facing the tank wall) and seal weld the inner diameter to the tank wall. Intermittant weld the outer sides of the mounting plate for enhanced strength.
- Optional: Continuous weld the outer sides of the mounting plate. In this case, the inner diameter of the mounting plate shall not be welded.
- Attach the burner to the mounting bolts.



- 1) TUBE-O-THERM® burner
- 2) Tank wall (customer's) - immersion tube should extend no more than 1/2" past this outside wall
- 3) Wall mounting plate (MAXON) (to be welded to customer's tank)
- 4) Gasket (MAXON) - high temperature sealant applied between burner body and gasket only
- 5) Existing weld - tank wall/tube
- 6) Immersion tube (customer's)
- 7) I.D. of MAXON-supplied mounting plate is 3/4" larger than O.D. of tube. This is to allow a gap for weld clearance where the tube welds to the tank wall.
- 8) Seal weld I.D.



#### Protective covers

Protective covers for burner should be added in the field if exposure to dripping condensate, splashing flux, exhaust steam, etc. is unavoidable. Any such cover should be removable to provide access to burner and should not interfere with control linkage motion, observation port viewing or air inlet.



**In some applications, the burner housing may become significantly warm. While this does not damage the burner or impede performance, guards or protective material may be required to protect personnel from burn hazards.**

## Start-up instructions for TUBE-O-THERM® Burner



**Important:** Do not discard packing material until all loose items are accounted for.

To prevent damage in transit, the spark ignitor, mounting ring, flame detector and connecting linkage components may be packed separately and shipped loose with the burner.

Instructions provided by the company or individual responsible for the manufacture and/or overall installation of a complete system incorporating MAXON burners take precedence over the installation and operating instructions provided by MAXON. If any of the instructions provided by MAXON are in conflict with local codes or regulations, please contact MAXON before initial start-up of equipment.



Read the combustion system manual carefully before initiating the start-up and adjustment procedure. Verify that all of the equipment associated with and necessary to the safe operation of the burner system has been installed correctly, that all pre-commissioning checks have been carried out successfully and that all safety-related aspects of the installation are properly addressed.

Initial adjustment and light-off should be undertaken only by a trained commissioning engineer.

### Safety interlocks

Guarantee that all the required safety locks as described in the applicable codes or regulations, or supplementary safety blocks requested for safe operation of the overall installation, are working properly and resulting in a positive safety-lock of the burner. Do not bypass any of these safety interlocks. This will result in unsafe operation.

### Checks during and after start-up

During and after start-up, check the integrity of the system. Check all bolted connections after first firing (first time on temperature) and retighten if necessary.

### Purge

For safety reasons, it is required to purge the installation sufficiently to ensure that all possible combustibles are evacuated before ignition. Refer to the applicable local codes and your specific application requirements to determine the purge time.

### Pilot ignition

Before ignition of the pilot, adjust the combustion air to the minimum burner air flow. Pilot will not ignite if too high an air flow. Set pilot gas flow to the correct value before pilot ignition attempt.

### Main burner ignition

Set correct gas flow for burner minimum capacity before attempt of main burner ignition.

After ignition of main burner, allow some time on minimum capacity to allow the burner parts to heat up slowly.

Adjust air/gas ratio. Set maximum capacity.

Once the main flame is ignited, adjust air/gas ratio of the burner to have the required combustion quality and slowly increase capacity.

## Troubleshooting

On occasions during cold start-up, a rumbling will occur in the tube until thermal equilibrium is established. This is normal and should disappear within a few minutes. A low-fire time period of approximately 2 minutes is recommended prior to high-fire operation.

If after several minutes of high-fire operation the rumbling has not decreased or the burner exhibits flame instability, shut off the burner and perform the following checks:

- Start all system-related fans and blowers. Check for proper motor rotation and impeller direction. Verify that all control interlocks are working. Allow air handling equipment to run for adequate purge of your manifolds and immersion tubes. With main gas shut off, manually advance TUBE-O-THERM® burner's operating crank to high-fire position so that air only flows through burner and immersion tube.
- Determine and verify differential air pressure at burner backplate test ports.  
Connect a manometer between the gas test port and the air test port. With the burner operating crank at high-fire position, fuel valve(s) closed, air handling systems and combustion air blower on, the manometer will read the differential combustion air pressure.

Air test port should be connected to the (+) end of the manometer as it will have the higher pressure over the gas test port.

NOTE: The chart below shows normal differential combustion air pressure readings in a no-fire condition. These readings will increase when burner is firing. The fuel gas pressures shown are at high fire condition.

Burner	Size	3"		4"		6"		8"			
	Model	Pkg.	EB	Pkg.	EB	Pkg.	EB	Pkg.	EB	HC [2]	HC [3]
Differential air pressure	"wc	1.5	2.8	1.3	2.8	2.1	3.9	1.4	2.7	2.7	2.6
Natural gas pressure [1]	"wc	32.1	63.0	25.8	56.9	29.2	62.1	33.0	72.0	110.8	139
Propane gas pressure [1]	"wc	13.6	29.0	12.9	28.4	15.4	33.7	16.5	37.0	48	61

[1] at burner gas test port

[2] With 8" tube

[3] With 10" tube

If your reading is higher than these cold air pressure readings, you have a suction in your tube. This condition should not be a problem.

If your reading is lower than the cold air differential pressure reading, you have a back pressure in your tube.



**If an exhaust stack damper is used, check that it is fully open and locked in place.**

Excessive back pressure can cause high CO emissions, smoke and carbon in firing tube and will restrict firing capacity of the burner.



**The differential air pressure setting can be used to diagnose system issues.**





**Burner performance can be drastically affected by tube configuration and static conditions within tube created by dampers in exhaust stack.**

- All TUBE-O-THERM® burners are shipped with the air/gas linkage factory set. Check centerline to centerline dimensions on the air/gas linkage to determine that it is proper length per dimension #5 on pages 1-2.1-19 to 26. The linkage is fabricated as a turnbuckle-style link. To adjust, simply loosen the locknut and twist the arm clockwise to shorten, or counter-clockwise to lengthen the linkage.
- If air/gas linkage dimension is correct per dimensions shown on pages 1-2.1-19 to 26, check wiring diagram to blower motor to determine that dual voltage motor has been wired properly. Failure to do so will result in differential air pressure readings that are out of specification. Correct wiring errors as necessary.
- If stack damper is used in error, make certain it is full open and locked (may need to be removed).

## Maintenance & inspection instructions

### Safety requirements

Regular inspection, testing and recalibration of combustion equipment according to the installation manual is an integral part of its safety. Inspection activities and frequencies shall be carried out as specified in the installation manual.

### Visual inspections

Regular visual inspection of all connections (air and gas piping to the burner, bolting of the burner to the tank wall) and burner flame size and aspect are essential.

In normal operation, little more is required than periodic checking to see that control motor linkage has not slipped from adjustment and that burner remains tightly mounted to the firing tube.

Burner should be shielded from splashing and physical abuse.

Inspect impeller for proper rotation, speed and dirt build-up which might reduce air flow. If your system includes an air filter, schedule maintenance as required for your plant environment.

### Combustion air filters

Always keep air filters clean for optimum system performance.

Clean as needed to remove any dry accumulations. To remove oil and dirt, wash elements in hot water and detergent as necessary.

Replaceable elements can be wrung gently and allowed to air dry before returning to service. Permanent elements should generally be blown dry after rinsing, and if desired, a light coating of suitable oil applied.

To avoid interruption to service, you may wish to order a spare element set.

### Flame sensing

Flame sensing is accomplished by a UV scanner. Keep scanner as close to burner as feasible. Use only minimal cooling air to scanner port. Excessive cooling air flow can impede flame detection.

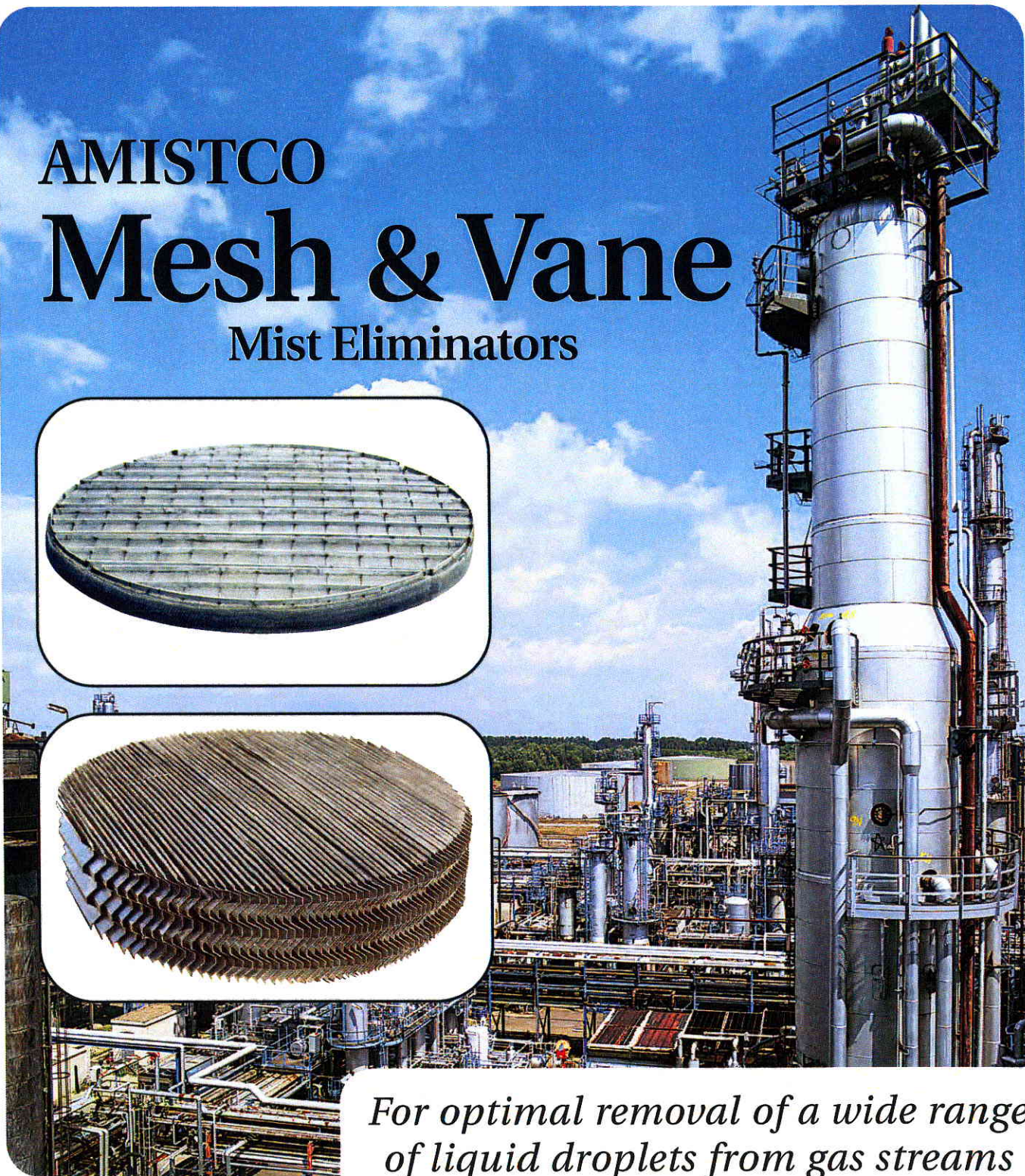
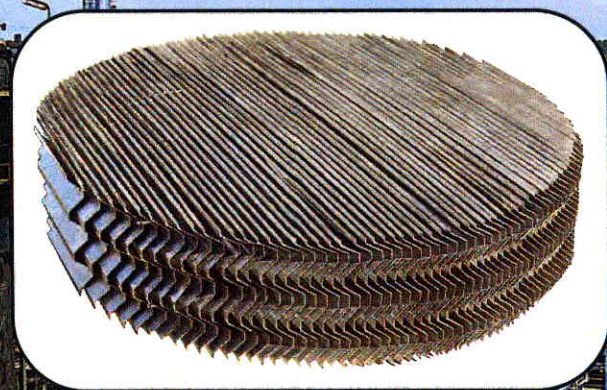
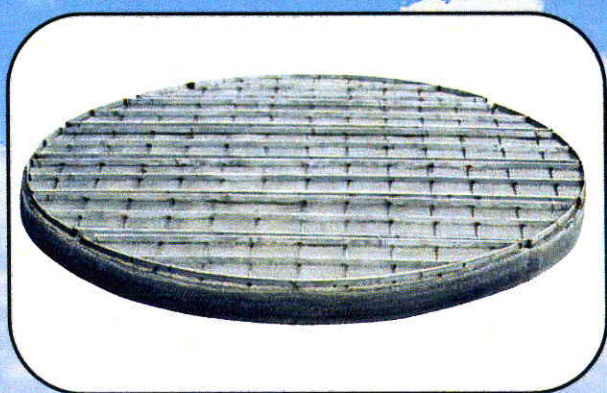
### Recommended spare parts

Keep local stock of spark ignitor. It is not recommended to keep local stock of other burner parts. Consult installation manual for burner spare parts and system accessories.



# AMISTCO Mesh & Vane

## Mist Eliminators



*For optimal removal of a wide range  
of liquid droplets from gas streams*



**AMISTCO**  
Separation Products, Inc.  
Worldwide



# Achieving the potential of today's mist eliminators

**I**N EVERY PROCESS involving contact between liquid and flowing gas, tiny mist droplets are carried away with the gas. (See Figure 1) This phenomenon is called entrainment.

Beginning about 1947, special devices were developed to remove mist from gas streams. Now known as mist eliminators, these devices provide a large surface area in a small volume to collect liquid without substantially impeding gas flow. Unlike filters, which hold particles indefinitely, mist eliminators coalesce (merge) fine droplets and allow the liquid to drain away. Gas typically flows upward through a horizontal mist eliminator.

More recently, advances in technology have enabled substantial progress in mist eliminator designs, materials, and application expertise. New products and methods of use have been found highly effective for many purposes, especially the following:

- Increasing throughput
- Downsizing new vessels
- Improving product purity
- Cutting operating costs
- Reducing environmental pollution
- Reducing downstream corrosion
- Increasing recovery of valuable liquids

In today's era of higher expectations of mist eliminators, achieving such benefits requires better knowledge on the part of users. It is no longer adequate for a designer simply to indicate "mist eliminator" in a drawing. The results will depend on proper specification of mist eliminator type (or combination of types), orientation, thickness, internal details, support and spacing in the vessel, vapor velocity and flow pattern, and many other considerations.

Despite the advances that have been made, mist eliminator specification is still as much art as science. For all but the most experienced users, proper application depends on consultation with a manufacturer's engineers. Such help should be considered for every new mist eliminator application as well as every upgrade or debottlenecking of existing applications.

**T**O MAKE THE MOST of a mist eliminator investment, the designer should become familiar with the considerations and possibilities involved. The purpose of this publication is to provide general guidelines and an overview of the field of mist elimination. Due to the numerous variables involved in specifying mist eliminators, designers and purchasers should consult with Amistco's separation specialists before making a final decision.

Figure 1. Typical mist eliminator application in distillation column

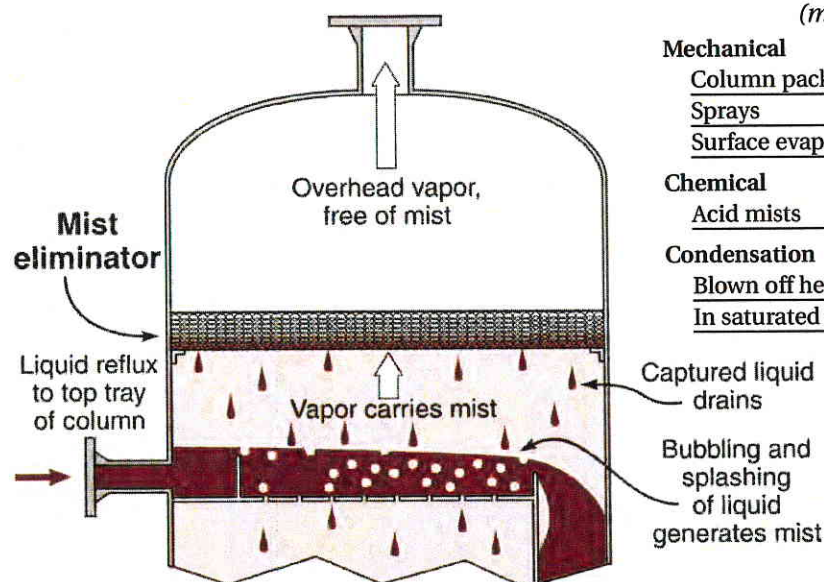


Table 1. Typical size range of mist droplets created by various processes (microns, micrometers)

<b>Mechanical</b>	
Column packing or trays	5 to 800 $\mu\text{m}$
Sprays	10 to 1,000 $\mu\text{m}$
Surface evaporation	3 to 1,000 $\mu\text{m}$
<b>Chemical</b>	
Acid mists	0.1 to 15 $\mu\text{m}$
<b>Condensation</b>	
Blown off heat exchanger surface	3 to 500 $\mu\text{m}$
In saturated vapor	0.1 to 50 $\mu\text{m}$



# Types of mist eliminators

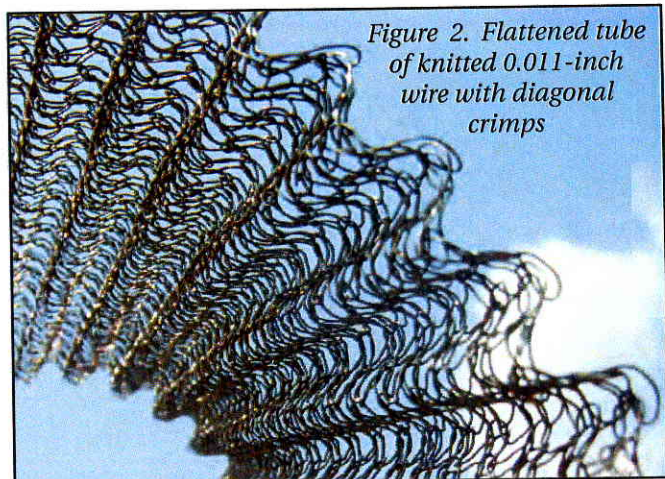


Figure 2. Flattened tube of knitted 0.011-inch wire with diagonal crimps

THERE ARE THREE general types of mist eliminators—mesh, vane, and fiber bed—and Amistco makes all three. Each is suited for a different class of applications, either alone or combined with another type.

## Mesh—pads and insertion type

The most widely applicable type of mist eliminator is made of metal or plastic wire with typical diameter of 0.006 to 0.011 inch, loosely knitted in a form resembling a cylindrical net. This tube is flattened to form a two-layer strip typically 12 inches wide, which is then crimped in a diagonal pattern with ridges as shown in Figure 2. When these strips are laid together, the ridges slant in alternate directions, forming an open structure through which gas flows



Figure 3. "Co-knit" mesh, including multifilament glass fibers knitted along with the wire

freely. Such mesh can efficiently capture mist droplets as small as 5 microns (micrometers).

For eliminating droplets down to 1 micron in diameter, multi-filament yarns of various plastics or glass are knitted into the mesh. The result is called a composite or co-knit mesh (Figure 3).

## Mesh pads

In the most familiar application of knitted mesh, the crimped strips are stacked to form a pad with typical thickness of four or six inches. (See Figure 4.) Rigidity is provided by a frame—usually metal—consisting of a grid on each side and rods passing through the mesh. Pads larger than about three feet across are fabricated in sections narrow enough to pass through a manway for assembly inside a vessel. Mesh pads can be made in almost any shape, but most are round (as in Figure 4) or rectangular.

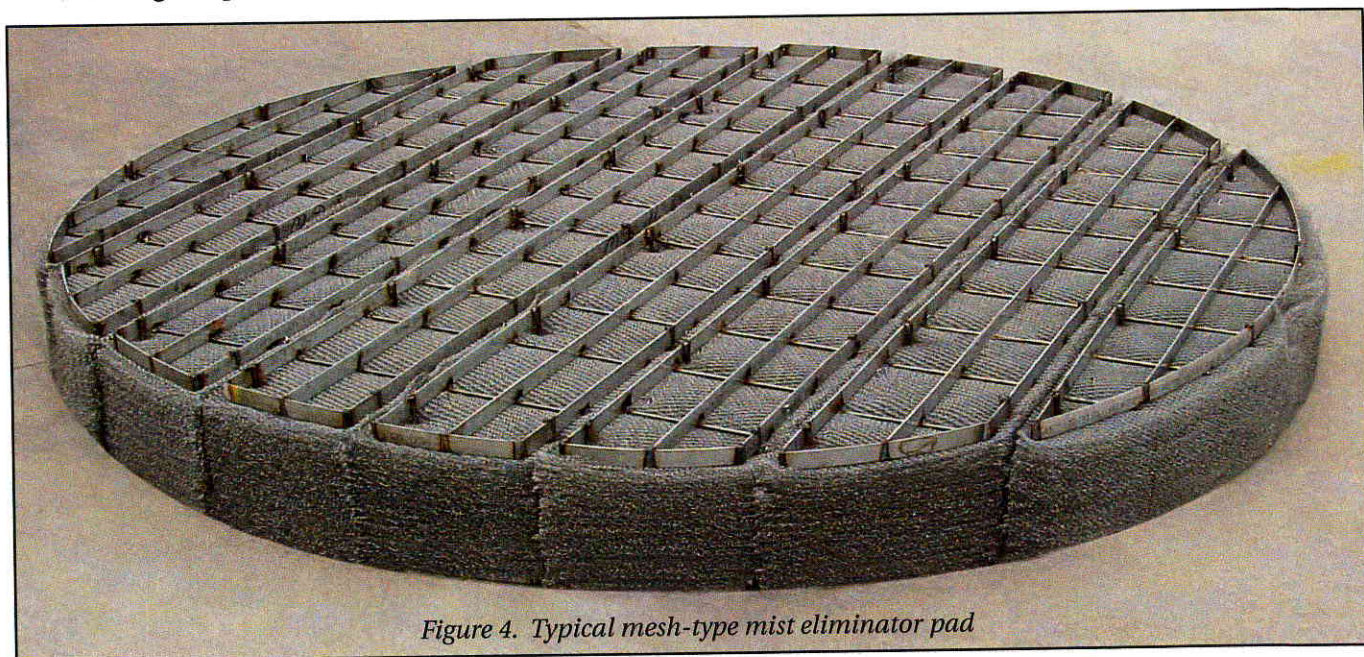


Figure 4. Typical mesh-type mist eliminator pad



## ***MistFix™ insertion mist eliminator***

In an exclusive Amistco innovation (U. S. Patent Number 5,985,004), knitted wire mesh is wrapped into a cylindrical core with a flange at one end. (See Figure 5.) MistFix mist eliminators extend vertically into a vessel from the vapor exit nozzle. As replacements or substitutes for pads, they greatly speed turnaround time, avoid entry of hazardous vessels, and eliminate the need for vessel cutting where there is no access port. They are ideally suited for existing vessels that do not have mist eliminators.

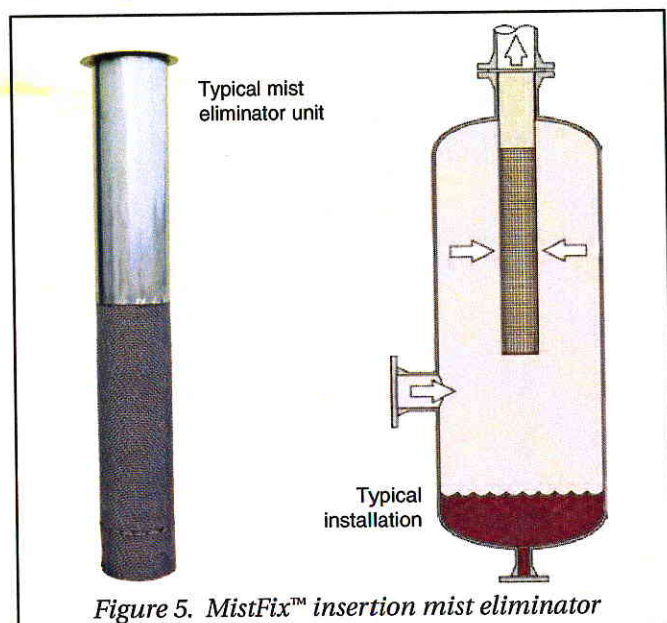


Figure 5. MistFix™ insertion mist eliminator

## ***Vane packs***

Also known as chevron or plate type, vane mist eliminators consist of closely spaced corrugated plates that force mist-laden gas to follow serpentine paths. These devices are generally not efficient for mist droplets smaller than about 20 microns, but they are sturdier than mesh pads and impose less pressure drop. Vane arrays can be mounted horizontally or vertically. They are preferred in applications involving high vapor velocities, low available pressure drop, viscous or foaming liquids, lodging or caking of solids, slugs of liquid, or violent upsets. Like mesh pads, vane units are usually round or rectangular. They

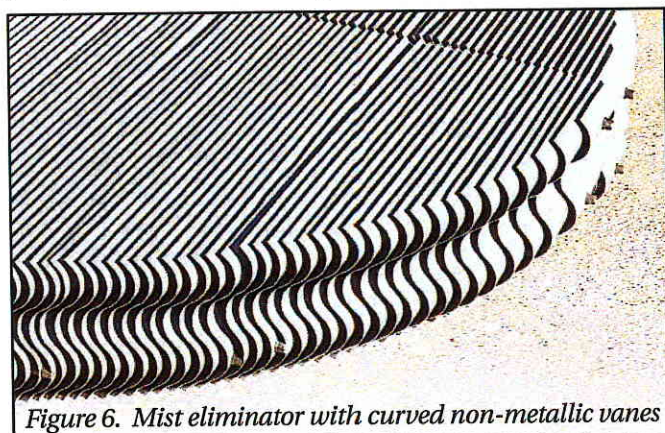


Figure 6. Mist eliminator with curved non-metallic vanes

are sometimes used in combination with mesh pads for optimum performance in special situations. Amistco's standard vanes (front cover) are available in metal or plastics and have various blade spacings and profiles. For special requirements, Amistco also supplies curved vanes such as the non-metallic variety shown in Figure 6.

## ***Double-pocket vanes***

Amistco's high-performance double-pocket vanes (Figure 7) can operate at higher capacity and higher efficiency than conventional vanes. The design features liquid pockets that prevent re-entrainment of the separated liquid droplets. This helps increase the capacity up to twice that of conventional vanes. The higher gas velocities also help in obtaining 100% removal of 8-micron droplets.

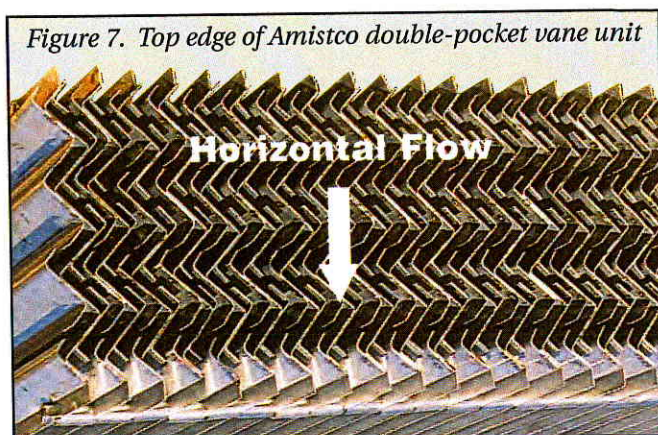


Figure 7. Top edge of Amistco double-pocket vane unit

## ***Fiber candles and panels***

Fiber mist eliminators can capture mist droplets so small (below 1 micron) that they appear as smoke or nearly invisible haze. These units employ fine fibers—typically cellulose, glass, or plastic—packed into a mat with thickness of a few inches. Fiber mist eliminators are mostly used in cylindrical form called candles (Figure 8) but are also available in flat panels. Amistco designs and manufactures these devices under an exclusive Western Hemisphere license from Begg Cousland. For additional details, see the "Amistco Candle Filters" brochure.

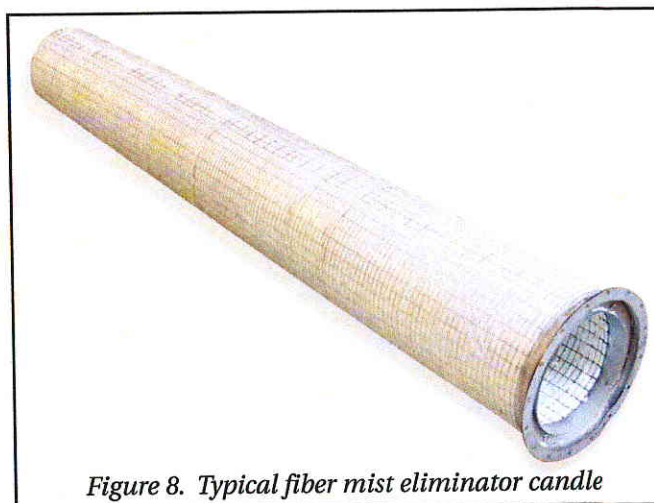


Figure 8. Typical fiber mist eliminator candle



# Fundamental considerations

**P**ROPER APPLICATION of mist eliminators is based on understanding how they work. Vane and mesh devices both employ the same mechanism—known as inertial impaction—and thus are subject to the same basic design rules. Fiber mist eliminators, however, capture submicron droplets (those smaller than one micron) by an entirely different phenomenon—known as Brownian motion—leading to very different behavior.

## Inertial capture in vanes

As shown in Figure 9, vanes bend the path of mist-laden gas into relatively tight curves. As the gas changes direction, inertia or momentum keeps mist droplets moving in straighter paths, and some strike adjacent vanes. There, they are held by surface forces and coalesce (merge) with other droplets, eventually trickling down. If the vane material is wettable, a surface film promotes coalescence and drainage. In the case of upward flow, coalesced liquid disengages from the bottom of the vanes as droplets large enough to fall through rising gas. In the case of horizontal flow (Figure 10), the liquid trickles down vanes to a drain below.

Figure 9. Capture of mist droplets in a vane array with vertical flow

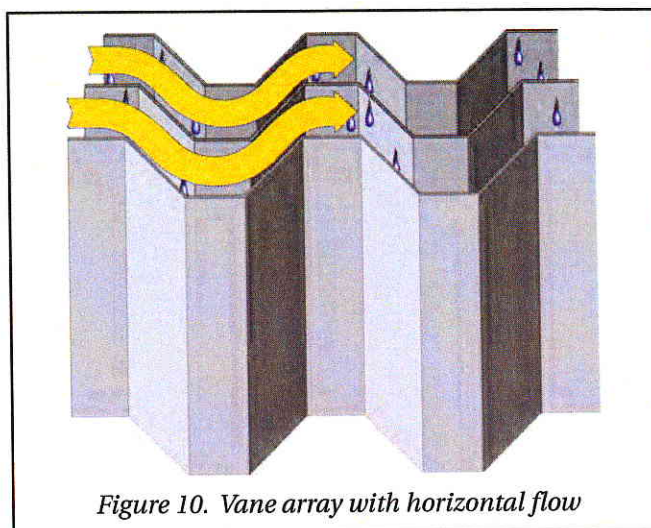
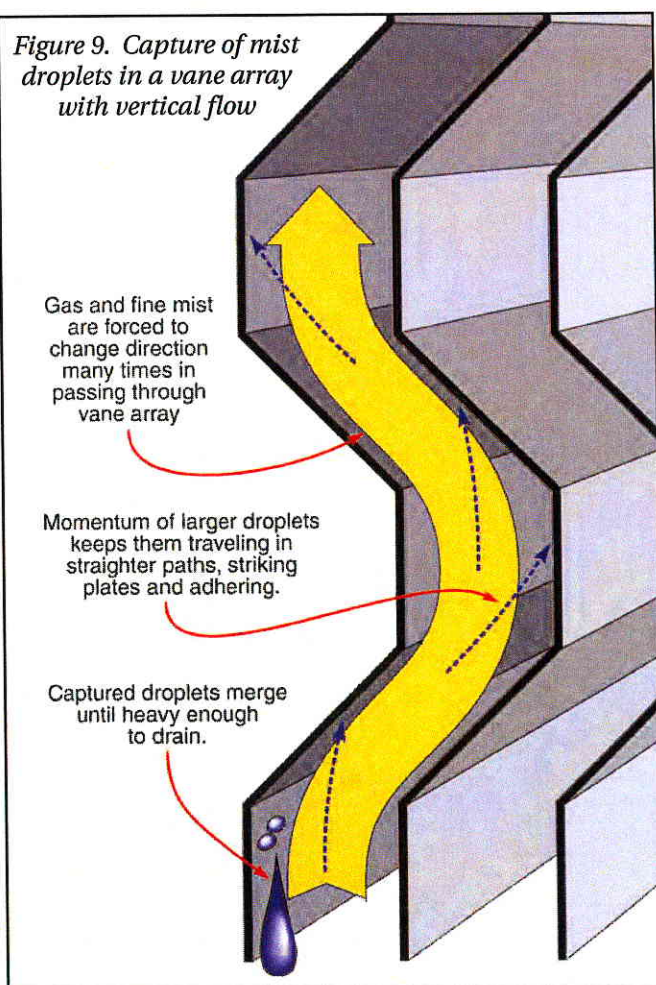
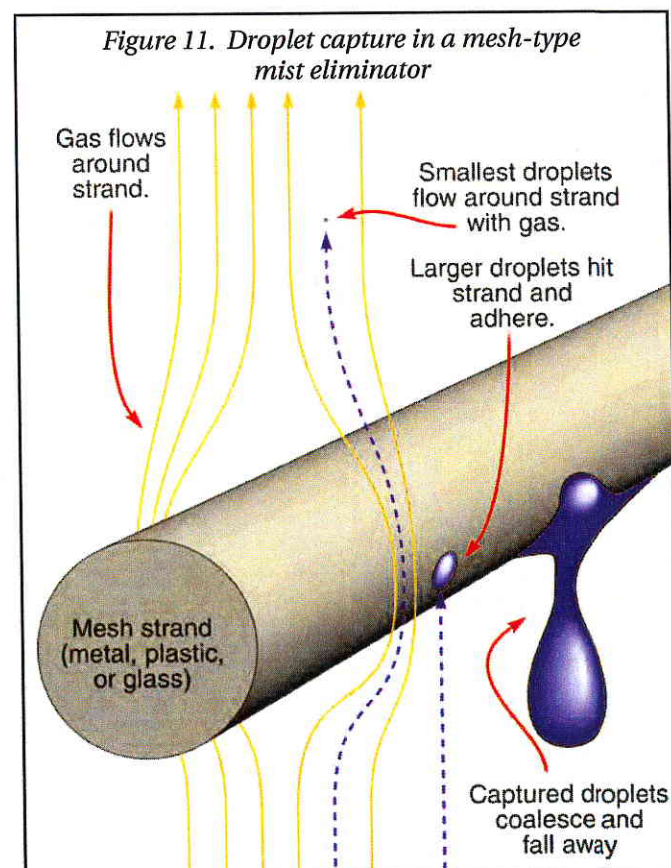


Figure 10. Vane array with horizontal flow

## Inertial capture in mesh

In a mesh-type mist eliminator (Figure 11), each strand acts as an obstruction around which gas must flow. Within a very short distance upstream of a filament, the gas turns aside sharply, but some mist droplets are unable to follow. They strike the filament, adhere, and coalesce to form droplets that are large enough to trickle down and fall away.

Figure 11. Droplet capture in a mesh-type mist eliminator

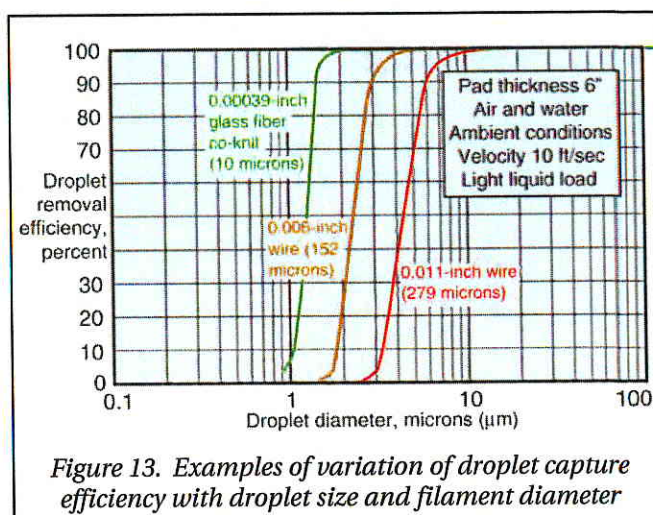
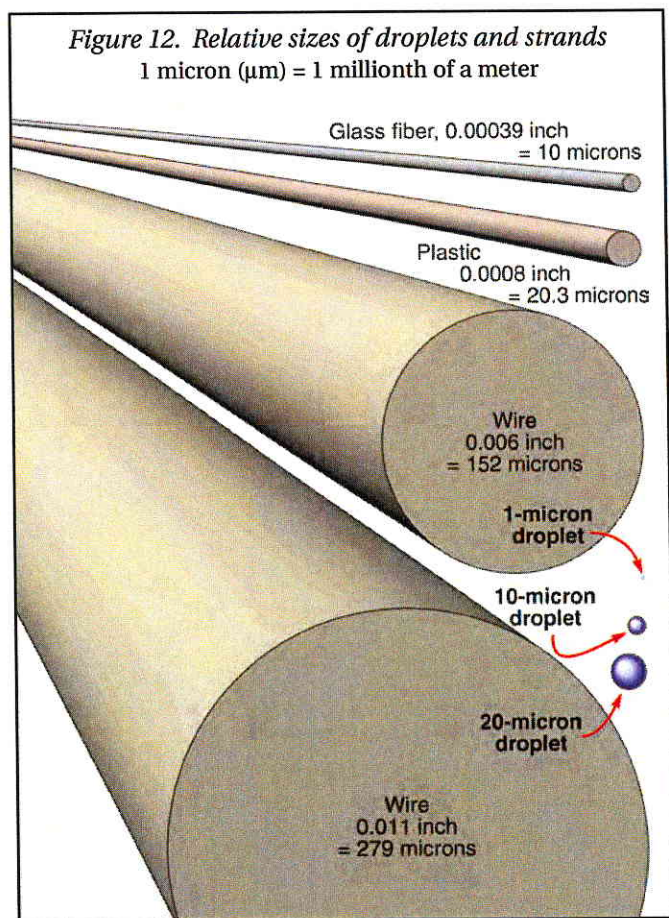




## Inertial capture efficiency

Based on the principle of inertial capture, it is easy to understand the behavior of a vane or mesh mist eliminator in terms of the efficiency with which it captures mist droplets. Consider a droplet encountering a mesh strand or a bend in a vane. (To help imagine the relative dimensions involved in the case of a mesh pad, see Figure 12.) The following factors determine whether the droplet strikes the surface or turns and flows around with the gas:

- 1. Droplet size:** The larger the droplet, the greater its momentum and the straighter its path when surrounding gas flows around an obstacle. Consequently, as seen in Figure 13, the efficiency of a given mist eliminator varies steeply with droplet size (keeping the same velocity and liquid and gas composition). For the example mesh pad made of 0.011-inch wire, efficiency jumps from nearly zero for 2-micron droplets to nearly 100% for 20-micron droplets. In a real situation, droplet sizes will be distributed over a range from less than one micron to well over 100 microns. The distribution curve may be narrow or broad, peaking anywhere within that range.
- 2. Strand diameter or corrugation spacing:** The smaller the diameter of a mesh strand (or the closer the spacing between the corrugations of a vane), the more abruptly oncoming gas turns aside, and the more difficult it is for mist droplets to follow the gas. Thus, finer strands can capture smaller droplets (again assuming the same



**Figure 13. Examples of variation of droplet capture efficiency with droplet size and filament diameter**

velocity and liquid and gas composition). This effect can be seen by comparing the three curves in Figure 13, representing mesh pads having different strand thicknesses. The 279-micron (0.011-inch) wire is 90% efficient for 6-micron droplets, compared to 3-micron droplets for the 152-micron (0.006-inch) wire and 1.5-micron droplets for 10-micron co-knit glass fibers. (See appendix for efficiency curves for various other types of Amistco mesh and vanes.)

- 3. Gas velocity:** The more rapidly a droplet approaches a mesh strand or vane corrugation, the greater its momentum, carrying it in a straighter path. Furthermore, at higher velocities, gas flow streamlines approach the obstacle more closely, resulting in tighter bends. Thus, the capture efficiency of a mist eliminator increases sharply with velocity until an upper limit is reached due to re-entrainment or flooding (discussed later).
- 4. Liquid density relative to gas density:** What causes a droplet to deviate from curving gas streamlines is not its momentum alone, but the *difference or ratio* between the droplet's momentum and that of the gas around it. In cases where the gas is nearly as dense as the liquid—for instance, at high pressures—the gas sweeps droplets around the obstacle more strongly, preventing capture.
- 5. Gas viscosity:** The more viscous the gas, the more drag it exerts on suspended droplets as the gas flows around mesh strands and vane corrugations, leading to reduced capture efficiency. The viscosity of a gas generally goes up with higher temperature.
- 6. Pad density and thickness:** Finally, the efficiency of a mesh pad also depends on how closely the strands are packed and on the thickness of the pad. Packing density is increased by knitting with more loops per inch and crimping with narrower ridges. It is measured in terms of pounds per cubic foot of pad. Thickness, in turn, is increased by piling on more layers of crimped mesh sheets. Thicker, denser pads bring trade-offs in terms of higher pressure drop and susceptibility to re-entrainment and flooding. Typical densities for stainless steel mesh are 9 and 12 pounds per cubic feet, and typical thicknesses are 4, 6, and 8 inches.



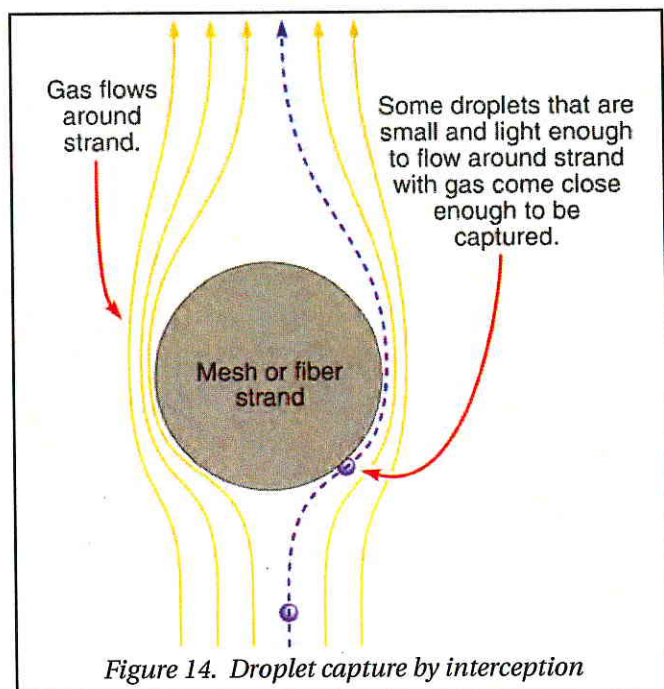


Figure 14. Droplet capture by interception

## Interception capture

There is another capture mechanism, usually called interception, that theoretically applies to both mesh and fiber mist eliminators. (See Figure 14.) Droplets that cannot be captured efficiently by inertial effects due to small size, low density, low velocity, etc., may nevertheless head so close to the centerline of a strand that they brush against the surface and adhere. In practice, however, interception is indistinguishable from inertial impaction and may be ignored in vanes and mesh.

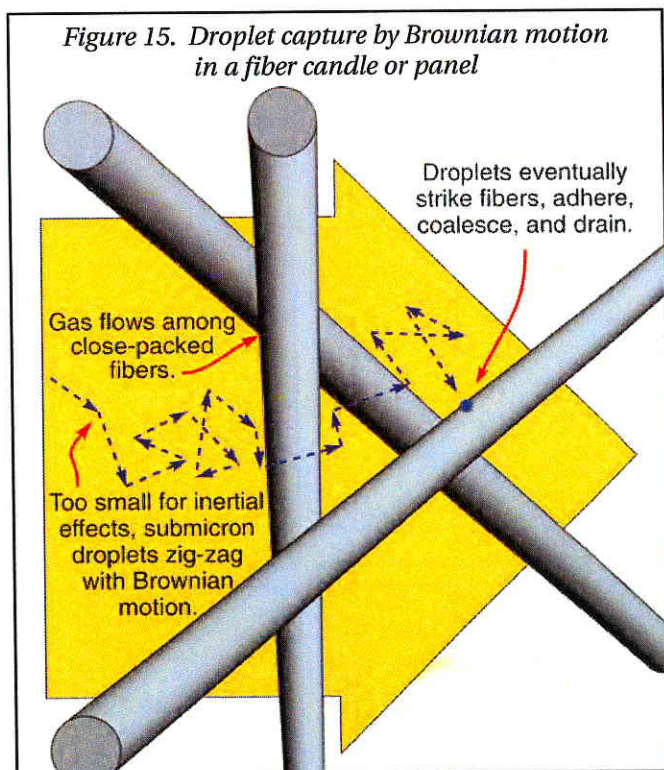


Figure 15. Droplet capture by Brownian motion in a fiber candle or panel

## Brownian capture

Brownian motion, the main capture mechanism for submicron droplets in fiber mist eliminators, is the frequent random jerks experienced by microscopic particles suspended in a gas or liquid. The cause is momentary inequalities in the number and speed of surrounding molecules hitting the particle from various directions. This tiny motion is enough to throw small droplets out of gas streamlines and against fibers that they would otherwise flow around. (See Figure 15.) Since flow momentum is not involved, capture efficiency is not improved by larger droplets, higher velocity, higher relative liquid density, or lower gas viscosity as for vanes and mesh. Instead, efficiency goes up with higher temperature, longer residence time in the mat (due to greater mat thickness or lower gas velocity), and closer packing of fibers, and down with greater droplet size and pressure.

Because fiber mist eliminators are so different from vane and mesh units in application and specification, further technical information about them is provided in separate Amisco publications.

## Capacity limits

The throughput capacity of a mesh or vane mist eliminator is limited by either of two related phenomena: flooding (choking with liquid) and re-entrainment (dislodging, suspension, and escape of coalesced droplets). In some low-pressure applications, the pressure drop across the device can also be an important consideration. These limiting factors are illustrated in Figures 16 and 17.

Figure 16 is based on experimental data for a typical horizontal mesh pad (Amisco mesh type TM-1109), using water sprayed at various rates into rising air. It shows how pressure drop varies with velocity and mist load in the vicinity of the typical operating range. The mist droplets are assumed to be within a size range suitable for capture by a pad of this sort—larger than 10 microns.

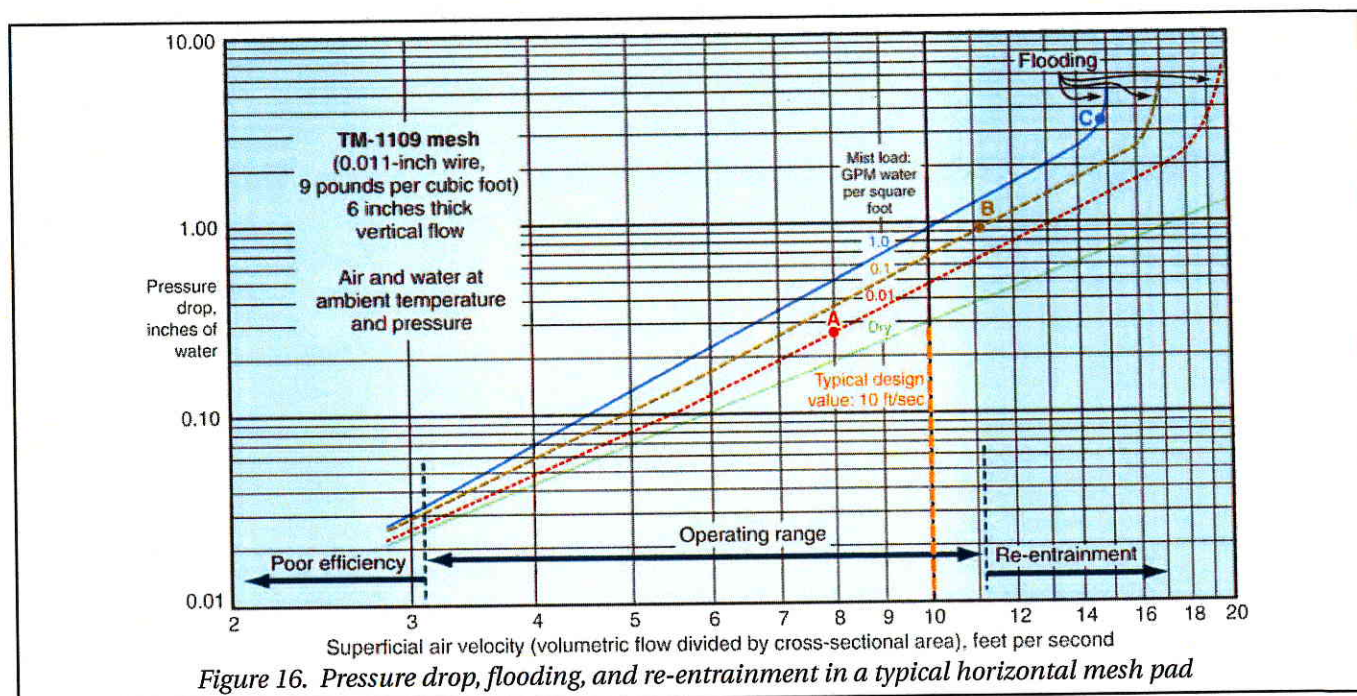
In Figure 16, notice that the pressure drop would be considered small in most applications—only about 2 or 3 inches of water column even at the most extreme velocity and load combination.

Also notice that pressure drop increases markedly with mist load. At 10 feet per second, the pressure drop for 1 GPM/ft<sup>2</sup> is more than three times that for a dry pad.

Figure 17, in turn, provides a subjective impression of what happens in a typical horizontal mesh pad at three different conditions of flow rate and mist load indicated as Points A, B, and C in Figure 16.

Point A represents a light mist load and a velocity of about 8 feet per second. Nearly all the incoming mist is captured well below the middle of the pad. The rest of the pad remains dry. In the active zone, coalesced droplets slip rapidly down the mesh wire. At the bottom, however, surface tension makes water accumulate on and between wires before falling away as streams and large drops. The





result is a thin flooded layer agitated by rising gas, generating a small amount of additional mist that is immediately captured again.

Point B, in turn, lies on a “moderate” load line at the velocity where a few re-entrained droplets begin to blow upward from the pad—about 11 ft/sec, under these conditions. Re-entrainment is roughly indicated by the darker background at the right side of the plot. (The darker area on the left, in turn, signifies poor capture efficiency.) The higher the liquid load, the lower the velocity at which re-entrainment occurs.

At Point B, velocity is high enough to detach coalesced droplets and lift some of them against the force of gravity. Most re-entrained droplets are relatively large—up to 1,000 microns (1 millimeter). Because of the higher liquid flow rate in the approaching mist and greater upward drag on captured liquid due to higher air velocity, the flooded zone fills an appreciable layer. Incoming mist rises higher in the pad before being captured.

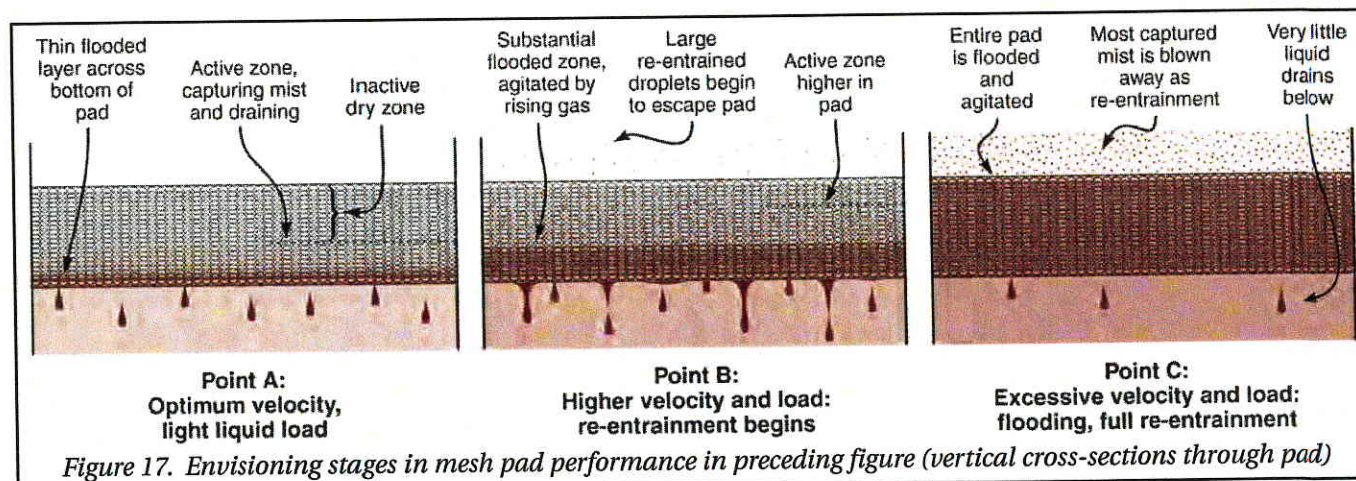
Finally, at Point C, the velocity is high enough not only to lift even the largest re-entrained droplets, but also to

retard drainage within the pad virtually to zero. The mesh is entirely choked with agitated liquid, generating mist droplets downstream across a wide range of sizes. Flooding has caused the pressure-drop curve to begin turning up sharply. If flow were increased beyond this point, the line would become almost vertical. For lower liquid loads, flooding occurs at higher velocities.

Similar behavior governs capacity limits also for vane mist eliminators and for horizontal flow through vertical mist eliminators of both types.

As to the influence of operating variables on these phenomena, flooding is promoted by high liquid load (volume percent mist in the incoming mixture), high gas velocity (especially for upward flow as in this example), and high liquid viscosity and surface tension (inhibiting drainage).

At very light liquid loads, re-entrainment can occur without appreciable flooding. However, with or without flooding, re-entrainment is promoted by higher gas velocity, smaller strand diameter or vane corrugation spacing, sharper corrugation angles, greater liquid load, lower liquid density relative to gas, lower liquid surface tension,





# Sizing for gas velocity using Souders-Brown equation

THE FOREGOING fundamental considerations lead directly to procedures for sizing a mesh or vane mist eliminator in terms of cross-sectional area, to handle the throughput for a particular application.

The key variable is gas velocity. In a given application, a mist eliminator has a definite operating range, indicated by the lighter background color in Figure 16. At velocities above this range, performance is impaired by re-entrainment, accompanied by flooding for all but the lightest mist loads. As velocity decreases within the operating range, droplet capture efficiency declines—more steeply for smaller droplets than for larger ones. At some point, the efficiency for droplets at the lower end of the size range has fallen to an unacceptable level. This is the bottom of the operating velocity range. For the typical case in Figure 16, it is roughly 3 ft/sec. Dividing that into the re-entrainment limit of about 11 ft/sec yields an approximate turndown ratio of nearly four to one for the operating range.

It is generally recommended that the nominal operating velocity be established toward the top of the range—about 10 feet per second for an air-water application such as this. Capture efficiency is higher there than farther down in the range, and performance is satisfactory at velocities from about 30% to 110% of that value.

A certain formula is widely used in sizing a mesh or vane mist eliminator for a given throughput. It generalizes the characteristics reflected in Figure 16 (notably excepting the low end of the operating range) from the base case of air and water to other gases and liquids. Called the Souders-Brown equation, it has long been the customary tool for predicting the maximum allowable vapor velocity in a trayed vapor-liquid contactor column. (M. Souders and G. G. Brown, "Design of fractionating Columns. I. Entrainment and Capacity," *Industrial & Engineering Chemistry*, Volume 26 [1934], Pages 98-103.) The equation is similar in form to Newton's Law for the terminal velocity of falling spheres.

The version of the Souders-Brown equation commonly used for mist eliminators establishes a variable K called the vapor load factor—also known as the system load factor, Souders-Brown velocity, or K factor—as follows:

$$K = V_G / \sqrt{(\rho_L - \rho_G) / \rho_G} \quad (\text{Equation 1})$$

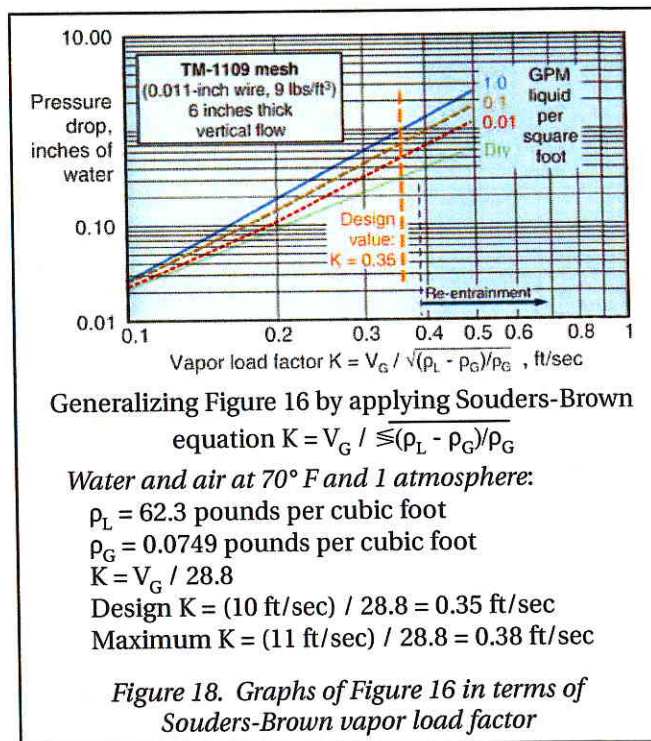
K = vapor load factor (Souders-Brown velocity)

$V_G$  = gas velocity

$\rho_L$  = liquid density in same units as  $\rho_G$

$\rho_G$  = gas density in same units as  $\rho_L$

The K factor can be considered an effective gas velocity for the purpose of expressing the throughput capacity limit, adjusted for the effects of liquid and gas density. This parameter allows data gathered for a given mist



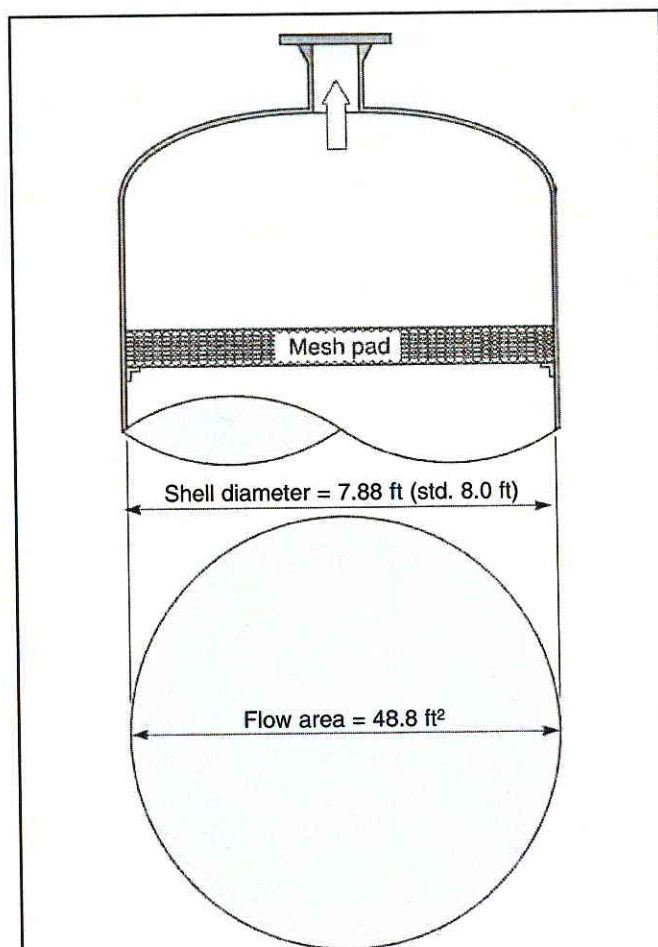
eliminator and gas-liquid system—typically air and water—to be used in sizing mist eliminators of the same type for different gases and liquids.

For example, Figure 18 shows the graphs of Figure 16, with the X axis converted from velocity to vapor load factor. The conversion factor is 28.8, calculated as shown in the figure. The effect is to shift the graphs of Figure 16 toward the left by that amount. The recommended design velocity of 10 feet per second for this mesh pad in this horizontal configuration corresponds to a load factor of about 0.35 ft/sec. The top of the operating range, in turn (11 ft/sec in Figure 16), lies at a load factor of about 0.38. Amisco publishes graphs such as this as design aids for a number of its products. (See appendix.)

The point is that re-entrainment, flooding, and log-log pressure-drop plots (although not capture efficiency) all correlate well with vapor load factor for different liquids and gases having various densities. The correlation generally holds at pressures from atmospheric up to about 7 atmospheres (100 psia) for gases and liquids whose surface tension and viscosity vary roughly alike with density. This includes most light hydrocarbons, for instance.

As an example, consider a TM-1109 mist eliminator in the top of a distillation column or knockout drum as shown in Figure 19. In this particular case, the square-root divisor in Equation 1 is 11.7. The design velocity (corresponding to a K-factor of 0.35 ft/sec) is 4.10 ft/sec—





**Horizontal 6-inch TM-1109 pad:**

Liquid droplet density  $\rho_L = 42.5 \text{ lbs/ft}^3$

Gas density  $\rho_G = 0.31 \text{ lbs/ft}^3$

$V_G = 11.7 K$  Recommended design K is 0.35 ft/sec

Design velocity:  $V_G = (11.7)(0.35 \text{ ft/sec}) = 4.10 \text{ ft/sec}$

Suppose the given design vapor rate is  $200 \text{ ft}^3/\text{sec}$

Then the required cross-sectional area  
 $= (200 \text{ ft}^3/\text{sec}) / (4.10 \text{ ft/sec}) = 48.8 \text{ ft}^2$

Flow area diameter  $= 2 \sqrt{48.8 \text{ ft}^2 / \pi} = 7.88 \text{ feet}$

Typically round up to next standard size: 8 feet

Figure 19. Sizing a mesh pad and vessel with Souders-Brown equation  $K = V_G / \sqrt{(\rho_L - \rho_G) / \rho_G}$

which is 41% of the value for air and water in Figure 16. The pressure-drop curves and re-entrainment and flooding points will likewise be shifted to about 41% of their positions in Figure 16.

Figure 19 also shows how the Souders-Brown equation is typically used in sizing a vessel with a mist eliminator of this type for flow area to achieve the design velocity ( $K = 0.35$ ) with a given design vapor flow rate.

Capture efficiency is an entirely separate matter from sizing. As explained earlier, the inertial capture efficiency for a given velocity, wire diameter, and droplet size is enhanced by higher liquid density and lower gas density.

Table 2. Recommended design values of Souders-Brown vapor load factor  $K = V_G / \sqrt{(\rho_L - \rho_G) / \rho_G}$

**Typical wire mesh pad (no co-knit yarn):**

Vertical flow  $\dots\dots\dots K = 0.35 \text{ ft/sec}$

Horizontal flow  $\dots\dots\dots K = 0.42 \text{ ft/sec}$

(For mist loads less than 0.1% volumetric, equivalent to 0.5 GPM/ft<sup>2</sup> at 10 ft/sec)

**Typical vane unit**

Vertical flow  $\dots\dots\dots K = 0.50 \text{ ft/sec}$

Horizontal flow  $\dots\dots\dots K = 0.65 \text{ ft/sec}$

**Double-pocket vane unit**

Vertical & horizontal flow  $K = 1.0 \text{ ft/sec}$

**Typical operating velocity range:**

30% to 110% of design K above

**Effective pressure range:**

Derate K as much as 40% for vacuum or pressures above 7 atmospheres (85 psig)

Such density changes result in a higher square-root divisor in the Souders-Brown equation. In the example case in Figure 19, however, the divisor (11.7) is *lower* than for air and water (28.5). Therefore the efficiency of this pad in this application at any given velocity will be lower than for air and water. To achieve minimal acceptable efficiency, the low end of the operating velocity range will be *higher* than the typical 30% of design velocity.

Table 2 shows generally recommended design values of K for various typical cases. Note that the values for vane units are higher than for mesh pads. This is because vanes are less susceptible to re-entrainment and flooding (discussed later).

Furthermore, for both mesh and vanes (except double-pocket vanes), design K-factors are higher for horizontal flow through vertical units than for vertical flow through horizontal units. This is because with horizontal flow, draining of captured liquid is not retarded by gas flowing in the opposite direction.

In all cases listed in Table 2, performance is typically acceptable over the same range of velocities discussed for vertical flow in a horizontal mesh pad—from about 30% to 110% of the design value. However, as explained before, the low end of the operating range varies in the opposite direction from the design velocity; the lower the design velocity, the narrower the acceptable range.

Similarly, as mentioned earlier, this correlation breaks down at pressures outside the range of 1 to 7 atmospheres. For higher or lower pressures, the design K-factor will be as low as 60% of the tabulated value for each configuration in Table 2.

Finally, the design K-factors for both horizontal and vertical mesh pads are applicable only for low to moderate mist loads—up to about 0.1% liquid by volume. For a velocity of 10 feet per second, this corresponds to about 0.5 gallons of liquid captured per minute per square foot. For higher mist loads, the design K should be derated. Vane units are not so sensitive to the effects of mist load on capacity.



# Mesh versus vanes—or both

**T**HE EFFICIENCY OF VANE mist eliminators is generally acceptable only for droplets larger than 10 or 20 microns in the case of air and water at ambient conditions. (Compare efficiency curves on Pages 14 and 15.) Furthermore, a vane unit is generally more expensive than a mesh pad in the same application. However, vanes have certain advantages that dictate their selection over mesh in some situations.

## Vane advantages

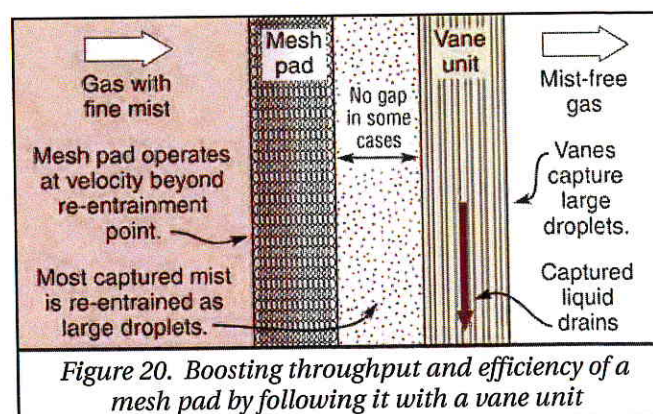
- 1. High velocity:** Being less susceptible to re-entrainment and flooding than mesh pads, vane units can operate at velocities 30 to 40 percent higher in both vertical and horizontal flow. (See Table 2.) Higher velocity helps close the efficiency gap with mesh.
- 2. High liquid load:** Vane units typically handle loads about 5 to 10 times greater than mesh pads: up to 10 gpm/ft<sup>2</sup> for VNM-50-6 vanes, versus 1 gpm/ft<sup>2</sup> for TM-1109 mesh (horizontal flow, air and water, ambient conditions).
- 3. Fouling and clogging:** Solid particles and debris that would lodge in a mesh pad, eventually requiring replacement or cleaning, pass through the much larger apertures of a vane unit. In applications that are subject to buildup of deposits, vane units can operate for much longer intervals without cleaning and can be cleaned much more readily than mesh pads.
- 4. Longer corrosion life:** The thickness of vanes gives them a substantially greater service life than mesh with the same corrosion rate. In a given corrosive service, a vane unit made of sheet metal will last much longer than a mesh pad made of the same alloy.
- 5. Low pressure drop:** The relative openness of vanes gives them an edge over mesh in applications where pressure drops of a few inches of water column are crucial. (See graphs on Pages 14 and 15.)
- 6. High liquid viscosity:** There are a few applications in which high viscosity impedes liquid drainage so severely that a mesh pad would flood at prohibitively low velocities and liquid loads. Vanes can handle much higher liquid viscosities.
- 7. Rugged construction:** When properly secured in place, a typical vane unit withstands violent surges and liquid slugs that would dislodge and even destroy the most rugged mesh pad.
- 8. Foam accommodation:** Because of liquid agitation in mesh pads, those devices are not generally recommended in applications subject to foaming. Vane units, by contrast, not only drain without foaming, but can actually break foam generated upstream.

In view of Items 3, 4, and 7 above, vane units are especially attractive in applications that require high reliability

for long periods without maintenance or replacement. Offshore platforms and long-running processes are prime examples.

## Mesh-vane combinations

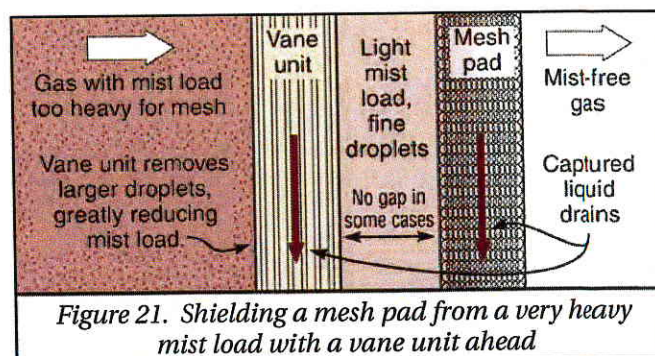
Vane units can be especially valuable in certain applications when used immediately upstream or downstream of mesh pads. Figures 20 and 21 illustrate these concepts with horizontal flow. With vertical flow, capacity will be



reduced as explained before for mesh pads and vane units alone.

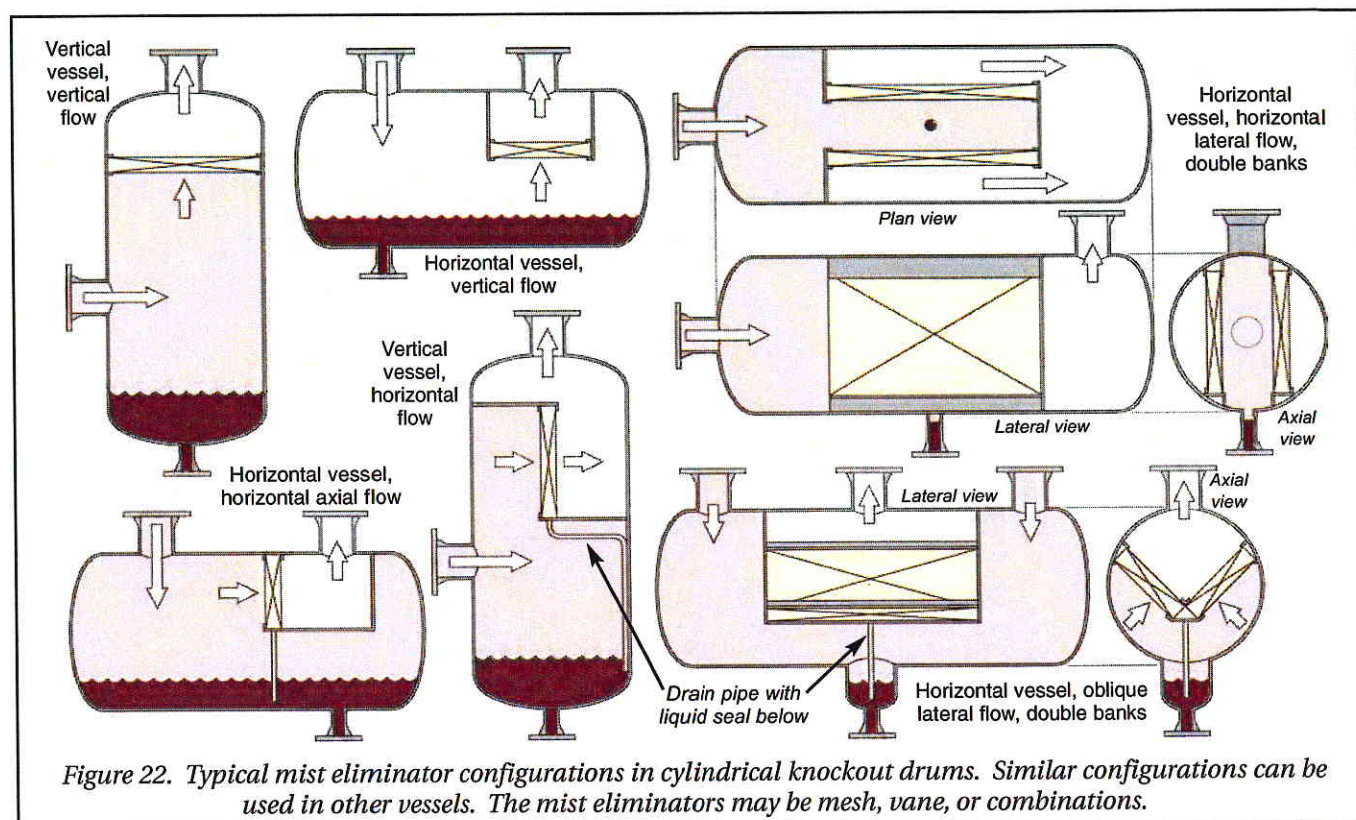
Mounting a vane unit downstream of a mesh pad as in Figure 20 combines the superior efficiency of the mesh with the superior K-factor of the vanes. The typical K-factor for horizontal flow is raised from 0.42 for mesh alone (Table 2) to 0.65 for vanes. When operated at or above the resulting design velocity, the mesh pad serves as an agglomerator or coalescer of fine mist droplets. Most liquid captured in the mesh pad is re-entrained as larger droplets whose sizes are well above the lower limit of the vane unit. Higher velocity also improves the mist elimination efficiency of the mesh. In applications of co-knit mesh where the re-entrainment velocity is exceptionally low, a downstream vane unit is indispensable.

On the other hand, mounting a vane unit upstream of a mesh pad as in Figure 21 combines the superior efficiency of mesh with the superior load and solids-handling





# Applying mist eliminators



dling ability of vanes. The K-factor of the combination is that of the mesh pad.

**T**HE FOLLOWING are some additional considerations that may come into play when applying mesh and vane mist eliminators in specific situations. Like other information in this publication, these guidelines can be useful for preliminary design purposes. *However, final decisions should not be made without consulting Amistco's separation specialists.*

## Vessel configurations

The simplified diagrams in Figure 22 show several typical configurations of mist eliminators in vessels. The mist eliminators may be mesh pads, vane units, or combinations as described on Page 11. The vessels depicted are cylindrical vapor-liquid separators, often called knockout drums. However, some of the same concepts may also apply to mist eliminators in process vessels, such as vapor-liquid contactor columns, evaporators, chillers, etc.

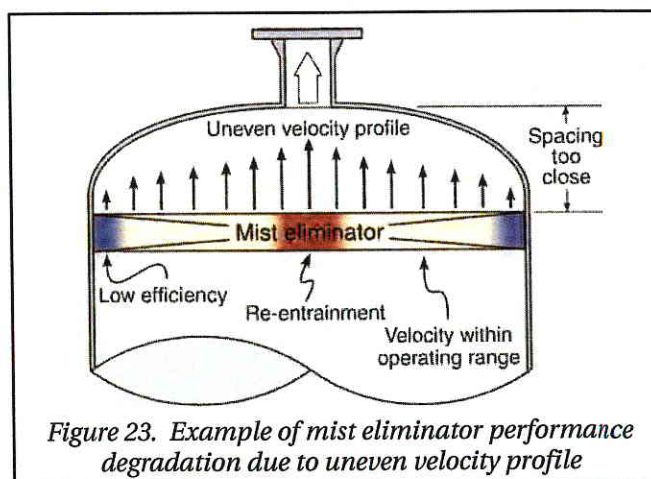
Considerations affecting selection of a mist eliminator configuration may include the following:

- Mist eliminator cross-sectional area to achieve design velocity with required vapor throughput
- Space available inside existing vessel
- Plant space available for the vessel
- Inlet and outlet locations to fit established piping

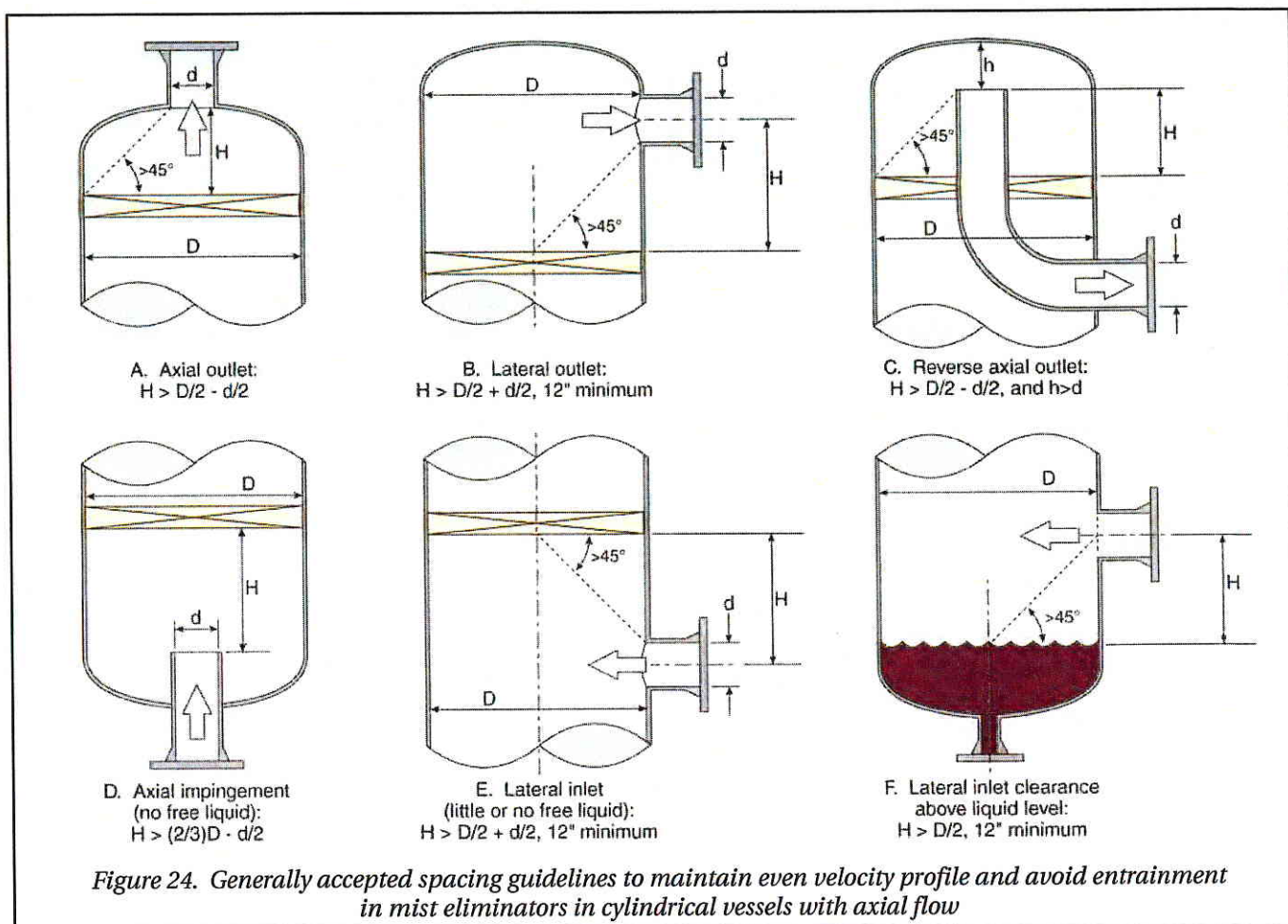
- Liquid holding capacity and drainage method
- Worker access for cleaning, replacement, etc.
- Support beams for large horizontal mist eliminators
- Internal flow constraints for efficient operation

## Internal flow guidelines

The last consideration in the foregoing list—internal flow constraints—is often overlooked but may be of primary importance. There are two main principles:







1. Maintain an even velocity profile across the mist eliminator element—whether mesh, vane, or combination. The object is to avoid situations such as shown in Figure 23. Here, the mist eliminator is mounted too close to the outlet nozzle. Excessive velocity in a region near the center of the mist eliminator results in substantial re-entrainment there. Furthermore, deficient velocity in a region around the perimeter causes low droplet removal efficiency in that area. The main key to an even velocity profile is to allow sufficient spacing between the mist eliminator and gas inlets and outlets. Items A through E in Figure 24 show some generally accepted guidelines in this regard for cylindrical vessels with axial flow through the mist eliminator. Flow distribution devices of various sorts can reduce the necessary spacing, but at the risk of violating the following principle.

2. Avoid strong turbulence and fluid shear in the wet part of the vessel. The main objective is to prevent entrainment of the collected liquid. This can be achieved by maintaining adequate separation between the inlet nozzle and the liquid surface as shown in Item F of Figure 24. Another objective is to prevent shearing of droplets into smaller particles that might pass through the mist eliminator.

## Application procedure

Based on all of the principles presented before, the procedure generally followed in designing a mist eliminator application involving mesh, vanes, or both is as follows:

1. Estimate the droplet size distribution (See Table 1).
2. Specify the required separation efficiency.
3. Tentatively choose a mist eliminator (mesh, vane, or combination; mesh or vane style; materials) considering droplet size, efficiency, corrosion, and wettability.
4. Tentatively select a mist eliminator orientation and placement in the vessel (Figure 22, etc.).
5. Calculate the necessary cross-sectional area and mist eliminator dimensions (Figure 19, Table 2, etc.).
6. Estimate separation efficiency and pressure drop within the required turndown range (Appendix and similar reference literature).
7. If the estimated results are not acceptable, repeat steps 3 through 6 with a different mist eliminator or vessel configuration.
8. Check for conformance with internal flow guidelines (Figures 23 and 24, etc.) and revise as necessary.

For easy separations that are familiar to the designer, sizing (Step 5) may be the only critical step. In even the simplest applications, however, the possibility of improve-



# Appendix

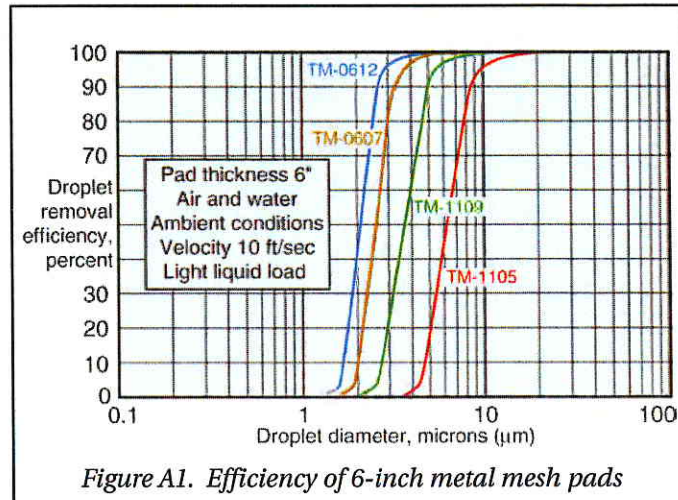


Figure A1. Efficiency of 6-inch metal mesh pads

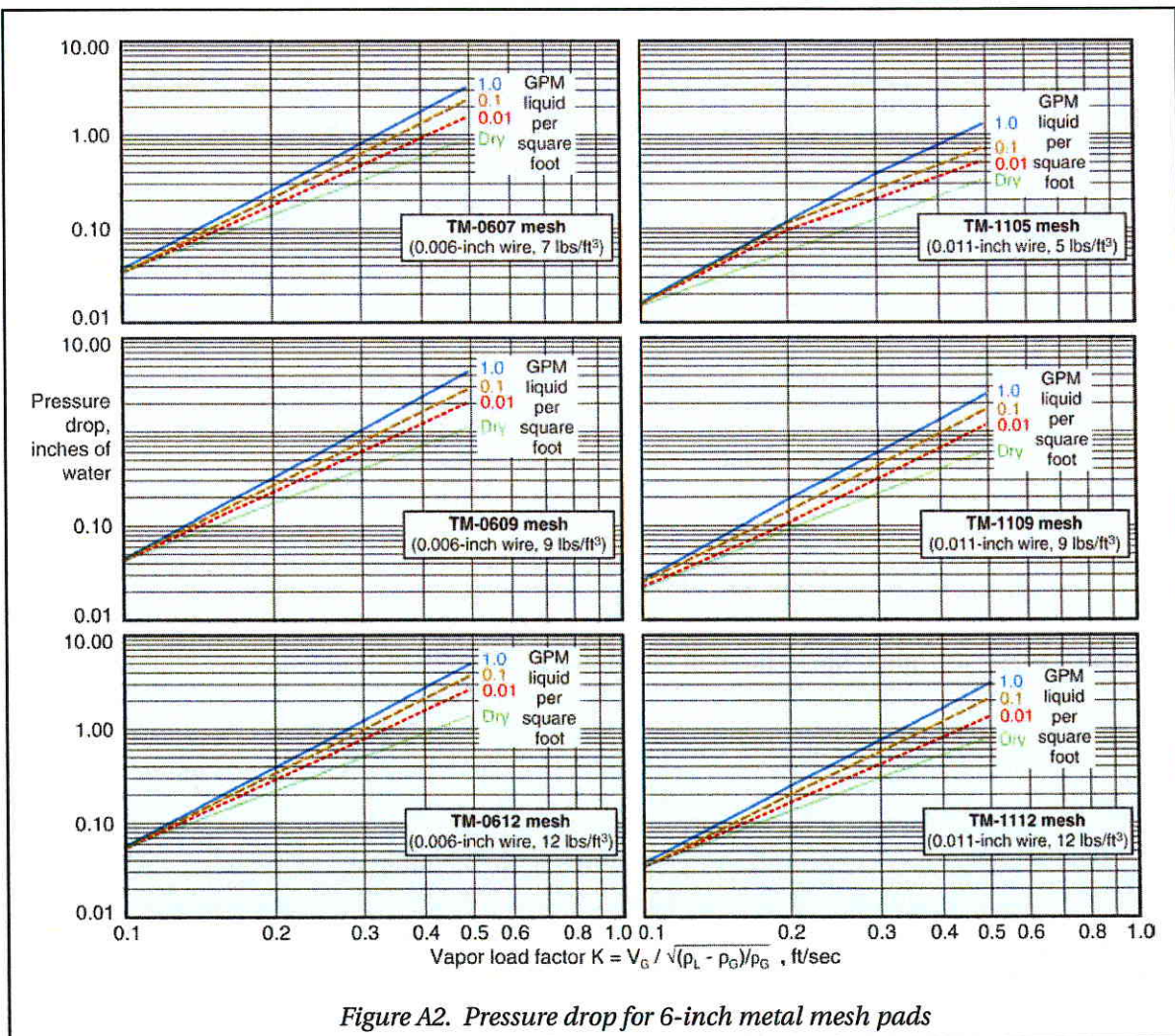
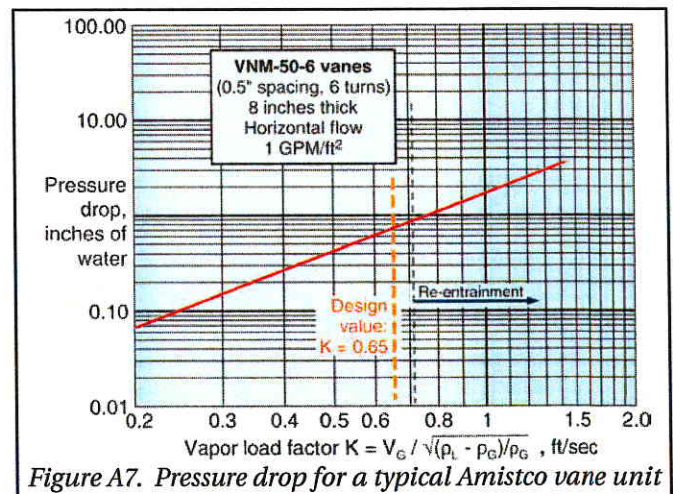
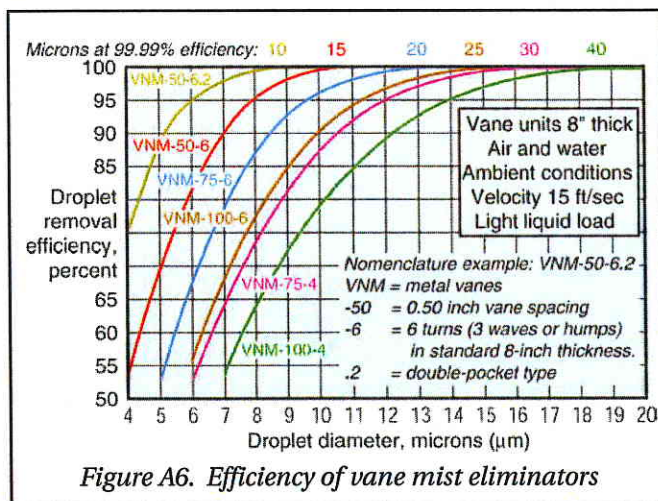
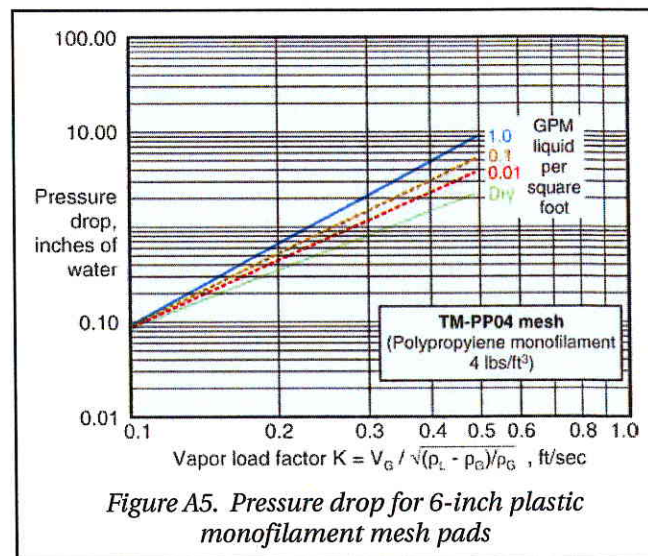
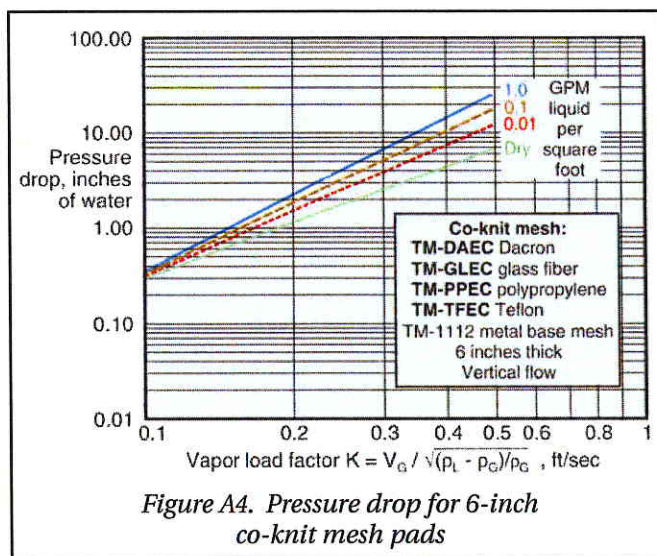
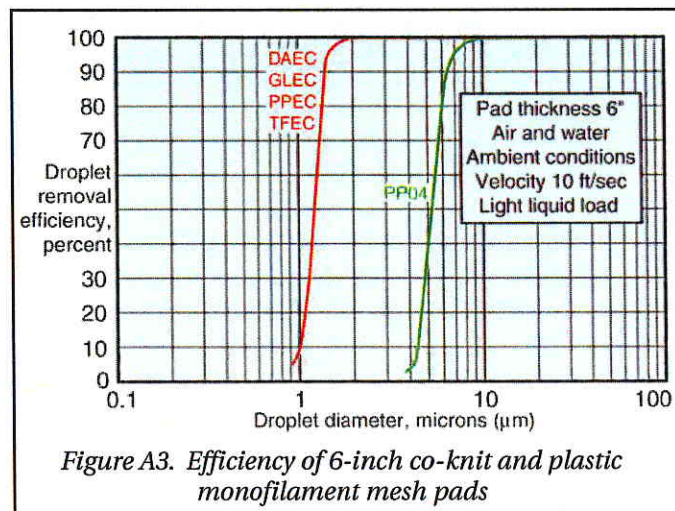


Figure A2. Pressure drop for 6-inch metal mesh pads









**A**MISTCO SEPARATION PRODUCTS, Inc., manufactures a wide range of phase contacting and separation equipment for both routine replacement and new construction. In addition to mist eliminators, our products include liquid-liquid coalescers and tower packings and internals. As Begg Cousland's exclusive Western Hemisphere licensee, Amistco brings to customers over 25 years of fiber mist eliminator manufacturing and application experience. We also fabricate numerous subassemblies and turnkey separation packages for primary contractors and end users worldwide.

Amistco began manufacturing knitted wire mesh mist eliminators in Alvin, Texas, in 1991. With greatly expanded knitting capabilities and an ever-widening range of products, Amistco now occupies a new 40,000-square-foot facility.

Our success was built upon prompt and consistent customer service. From the procurement of materials to delivery of finished

products, each phase of manufacturing is closely monitored to assure that customer specifications and performance requirements are satisfied or exceeded. Amistco separation specialists are readily available to assist customers with technical design questions.

Amistco products are sold worldwide through a network of marketing representatives. For the location of your nearest representative, contact Amistco or visit our Web site.



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**HONDA**

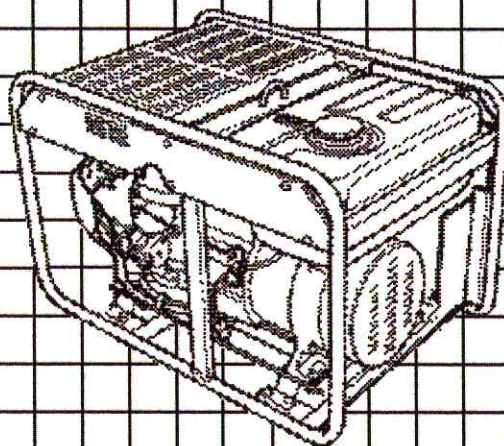
**Power**

**Equipment**

# Owner's Manual

## EB11000

**Click here to save this  
manual to your computer.**





## SPECIFICATIONS

### DIMENSIONS

Model	EB11000
Length	37.5 in (953 mm)
Width	24.3 in (617 mm)
Height	24.5 in (622 mm)
Dry weight	403 lb (183 kg)

### ENGINE

Model	GX620
Engine Type	4-Stroke, O.H.V. 2 cylinder
Displacement [Bore x Stroke]	37.5 cu in (614 cm <sup>3</sup> ) 3.03 x 2.60 in (77 x 66 mm)
Engine Speed	3600rpm
Cooling System	Forced air
Ignition System	Transistorized magneto
Engine Oil Refill Capacities	1.27 US qt (1.20 ℓ, 1.06 Imp qt) without oil filter replacement 1.59 US qt (1.50 ℓ, 1.32 Imp qt) with oil filter replacement
Fuel Tank Capacity	6.9 US gal (26 ℓ, 5.7 Imp gal)
Spark Plugs	BPR6ES (NGK)

### GENERATOR

Model		EB11000
Type		2-pole, revolving magnetic field type
AC output	Rated voltage	120/240 V
	Rated frequency	60 Hz
	Rated ampere	79.2/39.6 A
	Rated output	9.5 kVA
	Maximum output	10.5 kVA

### TUNEUP

ITEM	SPECIFICATION	MAINTENANCE
Spark plug gap	0.028-0.031 in (0.70-0.80 mm)	Refer to page: 36
Valve clearance	IN: 0.15 ± 0.02 mm (cold) EX: 0.20 ± 0.02 mm (cold)	See your authorized Honda dealer
Other specifications	No other adjustments needed.	

Specifications are subject to change without notice.

Effective Date: 4/16/2015

<b>FORMER OPERATOR:</b>	<b>NEW OPERATOR:</b>
Gasco Production Company N2575 7979 E. Tufts Avenue, Suite 11500 Denver, CO 80237 303-996-1805	Badlands Production Company N4265 7979 E. Tufts Avenue, Suite 11500 Denver, CO 80237 303-996-1805
CA Number(s):	Unit(s): Gate Canyon, Wilkin Ridge Deep, RBU-EOR-GRRV

**WELL INFORMATION:**

Well Name	Sec	TWN	RNG	API	Entity	Mineral	Surface	Type	Status
See Attached List									

**OPERATOR CHANGES DOCUMENTATION:**

1. Sundry or legal documentation was received from the **FORMER** operator on: 6/2/2015
2. Sundry or legal documentation was received from the **NEW** operator on: 6/2/2015
3. New operator Division of Corporations Business Number: 1454161-0143

**REVIEW:**

1. Surface Agreement Sundry from **NEW** operator on Fee Surface wells received on: 6/2/2015
2. Receipt of Acceptance of Drilling Procedures for APD on: N/A
3. Reports current for Production/Disposition & Sundries: 6/3/2015
4. OPS/SI/TA well(s) reviewed for full cost bonding: 1/20/2016
5. UIC5 on all disposal/injection/storage well(s) approved on: N/A
6. Surface Facility(s) included in operator change: None
7. Inspections of PA state/fee well sites complete on (only upon operators request): N/A

**NEW OPERATOR BOND VERIFICATION:**

1. Federal well(s) covered by Bond Number: SUR0027842
2. Indian well(s) covered by Bond Number: N/A
3. State/fee well(s) covered by Bond Number(s): SUR0027845  
SUR0035619 -FCB

**DATA ENTRY:**

1. Well(s) update in the **OGIS** on: 1/22/2016
2. Entity Number(s) updated in **OGIS** on: 1/22/2016
3. Unit(s) operator number update in **OGIS** on: 1/22/2016
4. Surface Facilities update in **OGIS** on: N/A
5. State/Fee well(s) attached to bond(s) in **RBDMS** on: 1/22/2016
6. Surface Facilities update in **RBDMS** on: N/A

**LEASE INTEREST OWNER NOTIFICATION:**

1. The **NEW** operator of the Fee (Mineral) wells has been contacted and informed by a letter from the Division of their responsibility to notify all interest owners of this change on: 1/22/2016

**COMMENTS:**

From: Gasco Production Company  
To: Badlands Production Company  
Effective Date: 4/16/2015

Well Name	Section	TWN	RNG	API Number	Entity	Mineral	Surface	Type	Status
FEDERAL 23-18G-9-19	18	090S	190E	4304752496		Federal	Federal	OW	APD
FEDERAL 14-17G-9-19	17	090S	190E	4304752522		Federal	Federal	OW	APD
FEDERAL 13-18G-9-19	18	090S	190E	4304752538		Federal	Federal	OW	APD
FEDERAL 23-29G-9-19	29	090S	190E	4304752544		Federal	Federal	OW	APD
FEDERAL 24-20G-9-19	20	090S	190E	4304752545		Federal	Federal	OW	APD
FEDERAL 31-21G-9-19	21	090S	190E	4304752546		Federal	Federal	OW	APD
Federal 323-29-9-19	29	090S	190E	4304753026		Federal	Federal	GW	APD
Federal 421-29-9-19	29	090S	190E	4304753027		Federal	Federal	GW	APD
Federal 322-29-9-19	29	090S	190E	4304753029		Federal	Federal	GW	APD
Federal 431-29-9-19	29	090S	190E	4304753030		Federal	Federal	GW	APD
Federal 432-29-9-19	29	090S	190E	4304753031		Federal	Federal	GW	APD
Federal 414-29-9-19	29	090S	190E	4304753070		Federal	Federal	GW	APD
FEDERAL 412-29-9-19	29	090S	190E	4304753073		Federal	Federal	GW	APD
FEDERAL 213-29-9-19	29	090S	190E	4304753076		Federal	Federal	GW	APD
federal 321-29-9-19	29	090S	190E	4304753078		Federal	Federal	GW	APD
FEDERAL 213-29-9-19	29	090S	190E	4304753079		Federal	Federal	GW	APD
FEDERAL 321-29-9-19	29	090S	190E	4304753080		Federal	Federal	GW	APD
Federal 212-29-9-19	29	090S	190E	4304753133		Federal	Federal	GW	APD
State 321-32-9-19	32	090S	190E	4304754479		State	State	GW	APD
State 423-32-9-19	32	090S	190E	4304754480		State	State	GW	APD
State 421-32-9-19	32	090S	190E	4304754481		State	State	GW	APD
State 413-32-9-19	32	090S	190E	4304754482		State	State	GW	APD
State 323-32-9-19	32	090S	190E	4304754483		State	State	GW	APD
State 431-32-9-19	32	090S	190E	4304754529		State	State	GW	APD
Desert Spring State 224-36-9-18	36	090S	180E	4304754541		State	State	GW	APD
Desert Spring State 243-36-9-18	36	090S	180E	4304754542		State	State	GW	APD
Desert Spring State 241-36-9-18	36	090S	180E	4304754543		State	State	GW	APD
FEDERAL 332-30-9-19	30	090S	190E	4304753012	19650	Federal	Federal	GW	DRL
WILKIN RIDGE FED 43-29-10-17	29	100S	170E	4301333098	15941	Federal	Federal	GW	OPS
LAMB TRUST 11-23-9-19	23	090S	190E	4304736915	16556	Fee	Fee	GW	OPS
SHEEP WASH FED 43-26-9-18	26	090S	180E	4304738573	17201	Federal	Federal	GW	OPS
FEDERAL 13-19-9-19	19	090S	190E	4304739777	18344	Federal	Federal	GW	OPS
FEDERAL 12-17-9-19	17	090S	190E	4304739800	17202	Federal	Federal	GW	OPS
GATE CYN 31-21-11-15	21	110S	150E	4301332391	13787	State	State	GW	P
WILKIN RIDGE ST 12-32-10-17	32	100S	170E	4301332447	14033	State	State	GW	P
GATE CYN 41-20-11-15	20	110S	150E	4301332475	14417	State	State	GW	P
WILKIN RIDGE FED 34-17-10-17	17	100S	170E	4301332560	14726	Federal	Federal	GW	P
GATE CYN 41-19-11-16	19	110S	160E	4301332611	14439	Federal	Federal	GW	P
WILKIN RIDGE ST 44-32-10-17	32	100S	170E	4301332619	15649	State	State	GW	P
WILKIN RIDGE FED 12-4-11-17	4	110S	170E	4301332674	15537	Federal	Federal	GW	P
WILKIN RIDGE ST 24-32-10-17	32	100S	170E	4301332676	15242	State	State	GW	P
WILKIN RIDGE FED 23-29-10-17	29	100S	170E	4301332679	14033	Federal	Federal	GW	P
GATE CYN ST 23-16-11-15	16	110S	150E	4301332685	16082	State	State	GW	P
WILKIN RIDGE ST 34-16-10-17	16	100S	170E	4301332730	15243	State	State	GW	P
WILKIN RIDGE FED 31-29-10-17	29	100S	170E	4301332773	15370	Federal	Federal	GW	P
WILKIN RIDGE 32-08	8	110S	170E	4301332778	14802	Federal	Federal	GW	P
GATE CYN ST 23-16-11-16	16	110S	160E	4301332888	15098	State	State	GW	P
WILKIN RIDGE FED 24-20-10-17	20	100S	170E	4301333081	15714	Federal	Federal	GW	P
WILKIN RIDGE FED 32-20-10-17	20	100S	170E	4301333087	15807	Federal	Federal	GW	P
WILKIN RIDGE FED 14-4-11-17	4	110S	170E	4301333099	15920	Federal	Federal	GW	P
RYE PATCH FED 22-21	22	110S	140E	4301333437	16919	Federal	Federal	GW	P
RYE PATCH FED 24-21	24	110S	140E	4301333443	16367	Federal	Federal	GW	P
SQUAW CROSSING U 5	2	100S	180E	4304730129	16266	State	State	OW	P
RBW 5-11D	11	100S	180E	4304730409	9005	Federal	Federal	OW	P
FEDERAL 7-25A	25	090S	180E	4304730624	9030	Federal	Federal	OW	P

From: Gasco Production Company  
To: Badlands Production Company  
Effective Date: 4/16/2015

RBU 6-2D	2	100S	180E	4304731190	7075	State	State	OW	P
NGC 33-18J	18	090S	190E	4304731200	6155	Federal	Federal	OW	P
RBU 13-2D	2	100S	180E	4304731280	16267	State	State	OW	P
RBU 16-3D	3	100S	180E	4304731352	16268	Federal	Federal	OW	P
RBU 10-11D	11	100S	180E	4304731357	7053	Federal	Federal	OW	P
RBU 8-10D	10	100S	180E	4304731364	4955	Federal	Federal	OW	P
RBU 15-3D	3	100S	180E	4304731539	9965	Federal	Federal	OW	P
RBU 12-12D	12	100S	180E	4304731651	10688	Federal	Federal	OW	P
RBU 2-10D	10	100S	180E	4304731801	10784	Federal	Federal	OW	P
RBU 3-15D	15	100S	180E	4304733600	13213	Federal	Federal	OW	P
RBU 3-12D	12	100S	180E	4304733739	14492	Federal	Federal	OW	P
STATE 7-36A	36	090S	180E	4304733741	14244	State	State	GW	P
FEDERAL 34-29	29	090S	190E	4304733750	13174	Federal	Federal	GW	P
FEDERAL 24-7 #1	7	100S	180E	4304733983	13182	Federal	Federal	GW	P
FEDERAL 23-29 #1	29	090S	190E	4304734111	13441	Federal	Federal	GW	P
FED 24-20-9-19	20	090S	190E	4304734168	14150	Federal	Federal	GW	P
FED 44-20-9-19	20	090S	190E	4304734169	14140	Federal	Federal	GW	P
FED 23-21-9-19	21	090S	190E	4304734199	13601	Federal	Federal	GW	P
FED 32-31-9-19	31	090S	190E	4304734201	13641	Federal	Federal	GW	P
FED 42-29-9-19	29	090S	190E	4304734202	13455	Federal	Federal	GW	P
PETES WASH 23-12 #1	12	100S	170E	4304734286	13492	Federal	Federal	GW	P
STATE 4-32B	32	090S	190E	4304734314	14440	State	State	GW	P
FED 14-18-2 #1	18	100S	180E	4304734539	13491	Federal	Federal	GW	P
FED 43-24-3 #1	24	100S	170E	4304734551	13726	Federal	Federal	GW	P
LYTHAM FED 22-22-9-19	22	090S	190E	4304734607	13640	Federal	Federal	GW	P
FED 11-21-9-19	21	090S	190E	4304734608	14151	Federal	Federal	GW	P
FED 22-30-10-18	30	100S	180E	4304734924	14280	Federal	Federal	GW	P
FEDERAL 43-30-9-19	30	090S	190E	4304735343	14202	Federal	Federal	GW	P
FED 11-22-9-19	22	090S	190E	4304735404	14203	Federal	Federal	GW	P
FED 42-21-9-19	21	090S	190E	4304735405	14928	Federal	Federal	GW	P
STATE 24-16-9-19	16	090S	190E	4304735588	14418	State	Federal	GW	P
FEDERAL 31-21-9-19	21	090S	190E	4304735606	14441	Federal	Federal	GW	P
FEDERAL 12-29-9-19	29	090S	190E	4304735614	14442	Federal	Federal	GW	P
FEDERAL 24-31-9-19	31	090S	190E	4304735623	14640	Federal	Federal	GW	P
FEDERAL 41-31-9-19	31	090S	190E	4304735624	14419	Federal	Federal	GW	P
LAMB TRUST 24-22-9-19	22	090S	190E	4304735732	14496	Fee	Fee	GW	P
LAMB TRUST 24-14-9-19	14	090S	190E	4304735733	14519	Fee	Fee	GW	P
FEDERAL 11-22-10-18	22	100S	180E	4304735808	15592	Federal	Federal	GW	P
FEDERAL 21-6-10-19	6	100S	190E	4304735844	14356	Federal	Federal	GW	P
DESERT SPRING ST 41-36-9-18	36	090S	180E	4304735845	14639	State	State	GW	P
STATE 12-32-9-19	32	090S	190E	4304735995	14871	State	State	GW	P
FEDERAL 12-20-9-19	20	090S	190E	4304736093	14976	Federal	Federal	GW	P
FEDERAL 32-20-9-19	20	090S	190E	4304736094	16120	Federal	Federal	GW	P
FEDERAL 23-30-9-19	30	090S	190E	4304736095	14872	Federal	Federal	GW	P
SHEEP WASH FED 34-26-9-18	26	090S	180E	4304736113	15096	Federal	Federal	GW	P
DESERT SPRING ST 23-36-9-18	36	090S	180E	4304736219	14738	State	State	GW	P
DESERT SPRING ST 21-36-9-18	36	090S	180E	4304736220	14763	State	State	GW	P
DESERT SPRING ST 12-36-9-18	36	090S	180E	4304736233	14764	State	State	GW	P
DESERT SPRING ST 43-36-9-18	36	090S	180E	4304736241	14992	State	State	GW	P
DESERT SPRING ST 34-36-9-18	36	090S	180E	4304736242	14716	State	State	GW	P
FEDERAL 14-31-9-19	31	090S	190E	4304736271	15884	Federal	Federal	GW	P
FEDERAL 12-31-9-19	31	090S	190E	4304736336	15086	Federal	Federal	GW	P
FEDERAL 21-31-9-19	31	090S	190E	4304736368	15605	Federal	Federal	GW	P
FEDERAL 23-31-9-19	31	090S	190E	4304736442	15715	Federal	Federal	GW	P
SHEEP WASH FED 43-25-9-18	25	090S	180E	4304736600	14977	Federal	Federal	GW	P
FEDERAL 43-19-9-19	19	090S	190E	4304736719	15186	Federal	Federal	GW	P

From: Gasco Production Company  
To: Badlands Production Company  
Effective Date: 4/16/2015

SHEEP WASH FED 21-25-9-18	25	090S	180E	4304736727	15475	Federal	Federal	GW	P
FEDERAL 21-30-9-19	30	090S	190E	4304736739	15476	Federal	Federal	GW	P
SHEEP WASH FED 23-25-9-18	25	090S	180E	4304736740	15213	Federal	Federal	GW	P
FEDERAL 23-19-9-19	19	090S	190E	4304736771	15355	Federal	Federal	GW	P
SHEEP WASH FED 41-25-9-18	25	090S	180E	4304736772	15338	Federal	Federal	GW	P
FEDERAL 41-30-9-19	30	090S	190E	4304736817	15212	Federal	Federal	GW	P
LAMB TRUST 34-22-9-19	22	090S	190E	4304736913	15187	Fee	Fee	GW	P
LAMB TRUST 14-14-9-19	14	090S	190E	4304736916	17012	Fee	Fee	GW	P
DESERT SPRING ST 33-36-9-18	36	090S	180E	4304737115	15011	State	State	GW	P
FEDERAL 14-17-9-19	17	090S	190E	4304737116	16163	Federal	Federal	GW	P
FEDERAL 34-18-9-19	18	090S	190E	4304737117	16275	Federal	Federal	GW	P
UTELAND ST 41-2-10-18	2	100S	180E	4304737132	15087	State	State	GW	P
UTELAND ST 43-2-10-18	2	100S	180E	4304737338	15365	State	State	GW	P
FEDERAL 41-19-9-19	19	090S	190E	4304737611	16311	Federal	Federal	GW	P
FEDERAL 32-30-9-19	30	090S	190E	4304737612	16051	Federal	Federal	GW	P
FEDERAL 12-30-9-19	30	090S	190E	4304737613	16052	Federal	Federal	GW	P
FEDERAL 21-19-9-19	19	090S	190E	4304737621	16253	Federal	Federal	GW	P
FEDERAL 14-18-9-19	18	090S	190E	4304737622	16264	Federal	Federal	GW	P
FEDERAL 34-30-9-19	30	090S	190E	4304737630	16557	Federal	Federal	GW	P
DESERT SPRING FED 21-1-10-18	1	100S	180E	4304737631	15961	Federal	Federal	GW	P
FEDERAL 12-1-10-18	1	100S	180E	4304737646	16023	Federal	Federal	GW	P
SHEEP WASH FED 14-25-9-18	25	090S	180E	4304737647	16121	Federal	Federal	GW	P
UTELAND ST 21-2-10-18	2	100S	180E	4304737676	16254	State	State	GW	P
UTELAND ST 12-2-10-18	2	100S	180E	4304737677	15806	State	State	GW	P
UTELAND ST 34-2-10-18	2	100S	180E	4304738028	16868	State	State	GW	P
FEDERAL 14-19-9-19	19	090S	190E	4304738336	16467	Federal	Federal	GW	P
FEDERAL 34-19-9-19	19	090S	190E	4304738337	16119	Federal	Federal	GW	P
SHEEP WASH FED 41-26-9-18	26	090S	180E	4304738351	16884	Federal	Federal	GW	P
SHEEP WASH FED 32-25-9-18	25	090S	180E	4304738352	16349	Federal	Federal	GW	P
SHEEP WASH FED 34-25-9-18	25	090S	180E	4304738353	16210	Federal	Federal	GW	P
FEDERAL 12-19-9-19	19	090S	190E	4304738407	16236	Federal	Federal	GW	P
SHEEP WASH FED 23-26-9-18	26	090S	180E	4304738465	16558	Federal	Federal	GW	P
SHEEP WASH FED 12-25-9-18	25	090S	180E	4304738469	16449	Federal	Federal	GW	P
FEDERAL 23-18-9-19	18	090S	190E	4304738575	16312	Federal	Federal	GW	P
LAMB TRUST 34-22A-9-19	22	090S	190E	4304738673	15832	Fee	Fee	GW	P
UTELAND FED 42-11-10-18	11	100S	180E	4304738896	16792	Federal	Federal	GW	P
STATE 21-32B	32	090S	190E	4304739170	16309	State	State	GW	P
STATE 22-32A	32	090S	190E	4304739171	16308	State	State	GW	P
STATE 21-32A	32	090S	190E	4304739172	16310	State	State	GW	P
FEDERAL 11-19-9-19	19	090S	190E	4304739717	17054	Federal	Federal	GW	P
SHEEP WASH FED 31-25-9-18	25	090S	180E	4304739729	17241	Federal	Federal	GW	P
SHEEP WASH FED 11-25-9-18	25	090S	180E	4304739730	17266	Federal	Federal	GW	P
DESERT SPG FED 41-1-10-18	1	100S	180E	4304739773	17013	Federal	Federal	GW	P
FED 32-19X-9-19(RIGSKID)	19	090S	190E	4304740233	17014	Federal	Federal	GW	P
FEDERAL 23-30G-9-19	30	090S	190E	4304751280	18211	Federal	Federal	OW	P
FEDERAL 34-19G-9-19	19	090S	190E	4304751281	18210	Federal	Federal	OW	P
FEDERAL 442-30-9-19	30	090S	190E	4304752870	19647	Federal	Federal	GW	P
FEDERAL 333-30-9-19	30	090S	190E	4304752872	19648	Federal	Federal	GW	P
FEDERAL 423-30-9-19	30	090S	190E	4304753011	19649	Federal	Federal	GW	P
Desert Springs State 412-36-9-18	36	090S	180E	4304753324	19783	State	State	GW	P
Desert Springs State 424-36-9-18	36	090S	180E	4304753325	19783	State	State	GW	P
Desert Springs State 133-36-9-18	36	090S	180E	4304753326	19747	State	State	GW	P
Desert Spring State 142-36-9-18	36	090S	180E	4304753327	19747	State	State	GW	P
DESERT SPRINGS ST 422-36-9-18	36	090S	180E	4304753328	19783	State	State	GW	P
WILKIN RIDGE ST 31-32-10-17	32	100S	170E	4301332677	15144	State	State	GW	S
RBW 4-11D	11	100S	180E	4304730718	16269	Federal	Federal	OW	S

From: Gasco Production Company  
To: Badlands Production Company  
Effective Date: 4/16/2015

RBU 2-11D	11	100S	180E	4304730826	16270	Federal	Federal	OW	S
RBU 6-11D	11	100S	180E	4304731192	16271	Federal	Federal	OW	S
STATE 2-32B	32	090S	190E	4304732221	11371	State	State	GW	S
STATE 9-36A	36	090S	180E	4304732225	11364	State	State	GW	S
FEDERAL 13-30B	30	090S	190E	4304733581	13249	Federal	Federal	GW	S
STATE 13-36A	36	090S	180E	4304733598	17838	State	State	GW	S
FEDERAL 16-26A	26	090S	180E	4304733601	12928	Federal	Federal	GW	S
FEDERAL 31-29	29	090S	190E	4304733653	13077	Federal	Federal	GW	S
RBU 1-10D	10	100S	180E	4304734312	16265	Federal	Federal	OW	S
FEDERAL 13-18-9-19	18	090S	190E	4304739776	17149	Federal	Federal	GW	S



STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

FORM 9

**SUNDRY NOTICES AND REPORTS ON WELLS**

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input checked="" type="checkbox"/> OTHER _____		5. LEASE DESIGNATION AND SERIAL NUMBER: UTU-76482
2. NAME OF OPERATOR: Gasco Production Company		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
3. ADDRESS OF OPERATOR: 7979 E. Tufts Ave. CITY Denver STATE CO ZIP 80237		7. UNIT or CA AGREEMENT NAME:
PHONE NUMBER: (303) 483-0044		8. WELL NAME and NUMBER: Desert Spring Fed 21-1-10-18
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0633 FNL 1512 FWL		9. API NUMBER: 4304737631
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 1 10S 18E S		10. FIELD AND POOL, OR WILDCAT: Uteland Butte

COUNTY: Uintah

STATE: UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: 4/16/2015	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
<input type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion:	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input checked="" type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> OTHER: _____
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Gasco Production Company requests a change of operator on this well, in addition to the wells on the attached list from Gasco Production Company to Badlands Production Company, effective date of 4/16/2015.

Gasco Production Company  
7979 E Tufts Ave, Suite 1150  
Denver CO 80237  
303-996-1805

Michael Decker, Exec. Vice President & COO

Badlands Production Company  
7979 E Tufts Ave, Suite 1150  
Denver CO 80237  
303-996-1805

Michael Decker, Exec. Vice President & COO

RECEIVED

JUN 02 2015

DIV. OF OIL, GAS & MINING

NAME (PLEASE PRINT) Lindsey Cooke	TITLE Engineering Tech
SIGNATURE <i>Lindsey Cooke</i>	DATE 5/18/2015

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**APPROVED**

JAN 22 2016

DIV. OIL GAS & MINING  
BY: *Rachel Medina*

Well Name	Section	TWN	RNG	API	Entity	Mineral	Surface	Type	Status
FEDERAL 332-30-9-19	30	090S	190E	4304753012	19650	Federal	Federal	GW	DRL
WILKIN RIDGE FED 43-29-10-17	29	100S	170E	4301333098	15941	Federal	Federal	GW	OPS
LAMB TRUST 11-23-9-19	23	090S	190E	4304736915	16556	Fee	Fee	GW	OPS
SHEEP WASH FED 43-26-9-18	26	090S	180E	4304738573	17201	Federal	Federal	GW	OPS
FEDERAL 13-19-9-19	19	090S	190E	4304739777	18344	Federal	Federal	GW	OPS
FEDERAL 12-17-9-19	17	090S	190E	4304739800	17202	Federal	Federal	GW	OPS
GATE CYN 31-21-11-15	21	110S	150E	4301332391	13787	State	State	GW	P
WILKIN RIDGE ST 12-32-10-17	32	100S	170E	4301332447	14033	State	State	GW	P
GATE CYN 41-20-11-15	20	110S	150E	4301332475	14417	State	State	GW	P
WILKIN RIDGE FED 34-17-10-17	17	100S	170E	4301332560	14726	Federal	Federal	GW	P
GATE CYN 41-19-11-16	19	110S	160E	4301332611	14439	Federal	Federal	GW	P
WILKIN RIDGE ST 44-32-10-17	32	100S	170E	4301332619	15649	State	State	GW	P
WILKIN RIDGE FED 12-4-11-17	4	110S	170E	4301332674	15537	Federal	Federal	GW	P
WILKIN RIDGE ST 24-32-10-17	32	100S	170E	4301332676	15242	State	State	GW	P
WILKIN RIDGE FED 23-29-10-17	29	100S	170E	4301332679	14033	Federal	Federal	GW	P
GATE CYN ST 23-16-11-15	16	110S	150E	4301332685	16082	State	State	GW	P
WILKIN RIDGE ST 34-16-10-17	16	100S	170E	4301332730	15243	State	State	GW	P
WILKIN RIDGE FED 31-29-10-17	29	100S	170E	4301332773	15370	Federal	Federal	GW	P
WILKIN RIDGE 32-08	8	110S	170E	4301332778	14802	Federal	Federal	GW	P
GATE CYN ST 23-16-11-16	16	110S	160E	4301332888	15098	State	State	GW	P
WILKIN RIDGE FED 24-20-10-17	20	100S	170E	4301333081	15714	Federal	Federal	GW	P
WILKIN RIDGE FED 32-20-10-17	20	100S	170E	4301333087	15807	Federal	Federal	GW	P
WILKIN RIDGE FED 14-4-11-17	4	110S	170E	4301333099	15920	Federal	Federal	GW	P
RYE PATCH FED 22-21	22	110S	140E	4301333437	16919	Federal	Federal	GW	P
RYE PATCH FED 24-21	24	110S	140E	4301333443	16367	Federal	Federal	GW	P
RBW 5-11D	11	100S	180E	4304730409	9005	Federal	Federal	OW	P
FEDERAL 7-25A	25	090S	180E	4304730624	9030	Federal	Federal	OW	P
RBW 6-2D	2	100S	180E	4304731190	7075	State	State	OW	P
NGC 33-18J	18	090S	190E	4304731200	6155	Federal	Federal	OW	P
RBW 13-2D	2	100S	180E	4304731280	16267	State	State	OW	P
RBW 16-3D	3	100S	180E	4304731352	16268	Federal	Federal	OW	P
RBW 10-11D	11	100S	180E	4304731357	7053	Federal	Federal	OW	P
RBW 8-10D	10	100S	180E	4304731364	4955	Federal	Federal	OW	P
RBW 15-3D	3	100S	180E	4304731539	9965	Federal	Federal	OW	P
RBW 12-12D	12	100S	180E	4304731651	10688	Federal	Federal	OW	P
RBW 2-10D	10	100S	180E	4304731801	10784	Federal	Federal	OW	P
RBW 3-15D	15	100S	180E	4304733600	13213	Federal	Federal	OW	P
RBW 3-12D	12	100S	180E	4304733739	14492	Federal	Federal	OW	P
STATE 7-36A	36	090S	180E	4304733741	14244	State	State	GW	P
FEDERAL 34-29	29	090S	190E	4304733750	13174	Federal	Federal	GW	P
FEDERAL 24-7 #1	7	100S	180E	4304733983	13182	Federal	Federal	GW	P
FEDERAL 23-29 #1	29	090S	190E	4304734111	13441	Federal	Federal	GW	P
FED 24-20-9-19	20	090S	190E	4304734168	14150	Federal	Federal	GW	P
FED 44-20-9-19	20	090S	190E	4304734169	14140	Federal	Federal	GW	P
FED 23-21-9-19	21	090S	190E	4304734199	13601	Federal	Federal	GW	P
FED 32-31-9-19	31	090S	190E	4304734201	13641	Federal	Federal	GW	P
FED 42-29-9-19	29	090S	190E	4304734202	13455	Federal	Federal	GW	P
PETES WASH 23-12 #1	12	100S	170E	4304734286	13492	Federal	Federal	GW	P
STATE 4-32B	32	090S	190E	4304734314	14440	State	State	GW	P
FED 14-18-2 #1	18	100S	180E	4304734539	13491	Federal	Federal	GW	P
FED 43-24-3 #1	24	100S	170E	4304734551	13726	Federal	Federal	GW	P
LYTHAM FED 22-22-9-19	22	090S	190E	4304734607	13640	Federal	Federal	GW	P
FED 11-21-9-19	21	090S	190E	4304734608	14151	Federal	Federal	GW	P
FED 22-30-10-18	30	100S	180E	4304734924	14280	Federal	Federal	GW	P
FEDERAL 43-30-9-19	30	090S	190E	4304735343	14202	Federal	Federal	GW	P
FED 11-22-9-19	22	090S	190E	4304735404	14203	Federal	Federal	GW	P
FED 42-21-9-19	21	090S	190E	4304735405	14928	Federal	Federal	GW	P
STATE 24-16-9-19	16	090S	190E	4304735588	14418	State	Federal	GW	P

FEDERAL 31-21-9-19	21	090S	190E	4304735606	14441	Federal	Federal	GW	P
FEDERAL 12-29-9-19	29	090S	190E	4304735614	14442	Federal	Federal	GW	P
FEDERAL 24-31-9-19	31	090S	190E	4304735623	14640	Federal	Federal	GW	P
FEDERAL 41-31-9-19	31	090S	190E	4304735624	14419	Federal	Federal	GW	P
LAMB TRUST 24-22-9-19	22	090S	190E	4304735732	14496	Fee	Fee	GW	P
LAMB TRUST 24-14-9-19	14	090S	190E	4304735733	14519	Fee	Fee	GW	P
FEDERAL 11-22-10-18	22	100S	180E	4304735808	15592	Federal	Federal	GW	P
FEDERAL 21-6-10-19	6	100S	190E	4304735844	14356	Federal	Federal	GW	P
DESERT SPRING ST 41-36-9-18	36	090S	180E	4304735845	14639	State	State	GW	P
STATE 12-32-9-19	32	090S	190E	4304735995	14871	State	State	GW	P
FEDERAL 12-20-9-19	20	090S	190E	4304736093	14976	Federal	Federal	GW	P
FEDERAL 32-20-9-19	20	090S	190E	4304736094	16120	Federal	Federal	GW	P
FEDERAL 23-30-9-19	30	090S	190E	4304736095	14872	Federal	Federal	GW	P
SHEEP WASH FED 34-26-9-18	26	090S	180E	4304736113	15096	Federal	Federal	GW	P
DESERT SPRING ST 23-36-9-18	36	090S	180E	4304736219	14738	State	State	GW	P
DESERT SPRING ST 21-36-9-18	36	090S	180E	4304736220	14763	State	State	GW	P
DESERT SPRING ST 12-36-9-18	36	090S	180E	4304736233	14764	State	State	GW	P
DESERT SPRING ST 43-36-9-18	36	090S	180E	4304736241	14992	State	State	GW	P
DESERT SPRING ST 34-36-9-18	36	090S	180E	4304736242	14716	State	State	GW	P
FEDERAL 14-31-9-19	31	090S	190E	4304736271	15884	Federal	Federal	GW	P
FEDERAL 12-31-9-19	31	090S	190E	4304736336	15086	Federal	Federal	GW	P
FEDERAL 21-31-9-19	31	090S	190E	4304736368	15605	Federal	Federal	GW	P
FEDERAL 23-31-9-19	31	090S	190E	4304736442	15715	Federal	Federal	GW	P
SHEEP WASH FED 43-25-9-18	25	090S	180E	4304736600	14977	Federal	Federal	GW	P
FEDERAL 43-19-9-19	19	090S	190E	4304736719	15186	Federal	Federal	GW	P
SHEEP WASH FED 21-25-9-18	25	090S	180E	4304736727	15475	Federal	Federal	GW	P
FEDERAL 21-30-9-19	30	090S	190E	4304736739	15476	Federal	Federal	GW	P
SHEEP WASH FED 23-25-9-18	25	090S	180E	4304736740	15213	Federal	Federal	GW	P
FEDERAL 23-19-9-19	19	090S	190E	4304736771	15355	Federal	Federal	GW	P
SHEEP WASH FED 41-25-9-18	25	090S	180E	4304736772	15338	Federal	Federal	GW	P
FEDERAL 41-30-9-19	30	090S	190E	4304736817	15212	Federal	Federal	GW	P
LAMB TRUST 34-22-9-19	22	090S	190E	4304736913	15187	Fee	Fee	GW	P
LAMB TRUST 14-14-9-19	14	090S	190E	4304736916	17012	Fee	Fee	GW	P
DESERT SPRING ST 33-36-9-18	36	090S	180E	4304737115	15011	State	State	GW	P
FEDERAL 14-17-9-19	17	090S	190E	4304737116	16163	Federal	Federal	GW	P
FEDERAL 34-18-9-19	18	090S	190E	4304737117	16275	Federal	Federal	GW	P
UTELAND ST 41-2-10-18	2	100S	180E	4304737132	15087	State	State	GW	P
UTELAND ST 43-2-10-18	2	100S	180E	4304737338	15365	State	State	GW	P
FEDERAL 41-19-9-19	19	090S	190E	4304737611	16311	Federal	Federal	GW	P
FEDERAL 32-30-9-19	30	090S	190E	4304737612	16051	Federal	Federal	GW	P
FEDERAL 12-30-9-19	30	090S	190E	4304737613	16052	Federal	Federal	GW	P
FEDERAL 21-19-9-19	19	090S	190E	4304737621	16253	Federal	Federal	GW	P
FEDERAL 14-18-9-19	18	090S	190E	4304737622	16264	Federal	Federal	GW	P
FEDERAL 34-30-9-19	30	090S	190E	4304737630	16557	Federal	Federal	GW	P
DESERT SPRING FED 21-1-10-18	1	100S	180E	4304737631	15961	Federal	Federal	GW	P
FEDERAL 12-1-10-18	1	100S	180E	4304737646	16023	Federal	Federal	GW	P
SHEEP WASH FED 14-25-9-18	25	090S	180E	4304737647	16121	Federal	Federal	GW	P
UTELAND ST 21-2-10-18	2	100S	180E	4304737676	16254	State	State	GW	P
UTELAND ST 12-2-10-18	2	100S	180E	4304737677	15806	State	State	GW	P
UTELAND ST 34-2-10-18	2	100S	180E	4304738028	16868	State	State	GW	P
FEDERAL 14-19-9-19	19	090S	190E	4304738336	16467	Federal	Federal	GW	P
FEDERAL 34-19-9-19	19	090S	190E	4304738337	16119	Federal	Federal	GW	P
SHEEP WASH FED 41-26-9-18	26	090S	180E	4304738351	16884	Federal	Federal	GW	P
SHEEP WASH FED 32-25-9-18	25	090S	180E	4304738352	16349	Federal	Federal	GW	P
SHEEP WASH FED 34-25-9-18	25	090S	180E	4304738353	16210	Federal	Federal	GW	P
FEDERAL 12-19-9-19	19	090S	190E	4304738407	16236	Federal	Federal	GW	P
SHEEP WASH FED 23-26-9-18	26	090S	180E	4304738465	16558	Federal	Federal	GW	P
SHEEP WASH FED 12-25-9-18	25	090S	180E	4304738469	16449	Federal	Federal	GW	P
FEDERAL 23-18-9-19	18	090S	190E	4304738575	16312	Federal	Federal	GW	P

LAMB TRUST 34-22A-9-19	22	090S	190E	4304738673	15832	Fee	Fee	GW	P
UTELAND FED 42-11-10-18	11	100S	180E	4304738896	16792	Federal	Federal	GW	P
STATE 21-32B	32	090S	190E	4304739170	16309	State	State	GW	P
STATE 22-32A	32	090S	190E	4304739171	16308	State	State	GW	P
STATE 21-32A	32	090S	190E	4304739172	16310	State	State	GW	P
FEDERAL 11-19-9-19	19	090S	190E	4304739717	17054	Federal	Federal	GW	P
SHEEP WASH FED 31-25-9-18	25	090S	180E	4304739729	17241	Federal	Federal	GW	P
SHEEP WASH FED 11-25-9-18	25	090S	180E	4304739730	17266	Federal	Federal	GW	P
DESERT SPG FED 41-1-10-18	1	100S	180E	4304739773	17013	Federal	Federal	GW	P
FED 32-19X-9-19(RIGSKID)	19	090S	190E	4304740233	17014	Federal	Federal	GW	P
FEDERAL 23-30G-9-19	30	090S	190E	4304751280	18211	Federal	Federal	OW	P
FEDERAL 34-19G-9-19	19	090S	190E	4304751281	18210	Federal	Federal	OW	P
FEDERAL 442-30-9-19	30	090S	190E	4304752870	19647	Federal	Federal	GW	P
FEDERAL 333-30-9-19	30	090S	190E	4304752872	19648	Federal	Federal	GW	P
FEDERAL 423-30-9-19	30	090S	190E	4304753011	19649	Federal	Federal	GW	P
Desert Springs State 412-36-9-18	36	090S	180E	4304753324	19783	State	State	GW	P
Desert Springs State 424-36-9-18	36	090S	180E	4304753325	19783	State	State	GW	P
Desert Springs State 133-36-9-18	36	090S	180E	4304753326	19747	State	State	GW	P
Desert Spring State 142-36-9-18	36	090S	180E	4304753327	19747	State	State	GW	P
DESERT SPRINGS ST 422-36-9-18	36	090S	180E	4304753328	19783	State	State	GW	P
WILKIN RIDGE ST 31-32-10-17	32	100S	170E	4301332677	15144	State	State	GW	S
SQUAW CROSSING U 5	2	100S	180E	4304730129	16266	State	State	OW	S
RBW 4-11D	11	100S	180E	4304730718	16269	Federal	Federal	OW	S
RBW 2-11D	11	100S	180E	4304730826	16270	Federal	Federal	OW	S
RBW 6-11D	11	100S	180E	4304731192	16271	Federal	Federal	OW	S
STATE 2-32B	32	090S	190E	4304732221	11371	State	State	GW	S
STATE 9-36A	36	090S	180E	4304732225	11364	State	State	GW	S
FEDERAL 13-30B	30	090S	190E	4304733581	13249	Federal	Federal	GW	S
STATE 13-36A	36	090S	180E	4304733598	17838	State	State	GW	S
FEDERAL 16-26A	26	090S	180E	4304733601	12928	Federal	Federal	GW	S
FEDERAL 31-29	29	090S	190E	4304733653	13077	Federal	Federal	GW	S
RBW 1-10D	10	100S	180E	4304734312	16265	Federal	Federal	OW	S
FEDERAL 13-18-9-19	18	090S	190E	4304739776	17149	Federal	Federal	GW	S